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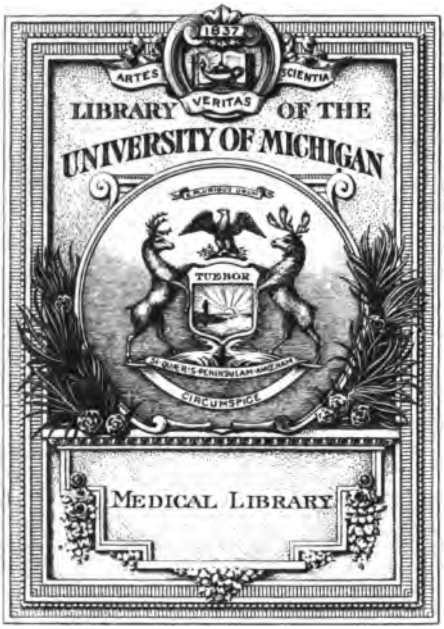

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The American Academy of Railway Surgeons

Transactions of the Fifth Annual Meeting, held at Omaha, Neb., October 12 and 13, 1899

Edited by
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Council Bluffs, Iowa

Chicago
American Medical Association Press
1900

THE HIGHER THE ORDER OF RAILWAY SURGERY THE GREATER
THE PROTECTION TO THE EMPLOYE, THE PASSENGER
AND THE COMPANY

DR. C. A. WHEATON
President American Academy of Railway Surgeons

UNIV. OF MICH.

From Med. Bldg.
8-26-1926

PREFACE

In presenting this, the sixth, volume of the Transactions of the American Academy of Railway Surgeons, to the profession in general and the Fellows of the Academy in particular, we feel that there are just grounds for believing that it will be received as well, if not better, than any of the preceding volumes.

We are confident that a perusal of its pages will show that the character and trend of the papers are evidences of more thorough and careful work, and a greater technical effort, which is confidently expected to become more evident in succeeding volumes.

The interest in the last session was enthusiastic, bespeaking increased efforts along the line indicated, and assuring us that the Academy has a place to fill, and of a determination on the part of its Fellows to see that it fills its place in a manner creditable to all connected therewith.

THE EDITOR.

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SOME POINTS IN THE DIAGNOSIS OF TRAUMATIC INJURIES OF THE CENTRAL NERVOUS SYSTEM.

BY J. T. ESKRIDGE, M.D.

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DENVER, COLO.

In as brief a space as possible I shall endeavor to consider some differential points in the diagnosis of various affections of the central nervous system, laying especial stress on such as result from traumatism. I shall include in these the psychic effects of shock and suggestion.

The first point to which to call attention is found in a short paper written by me and read by title, as I was not present, at the Fourth Annual Meeting of the Academy of Railway Surgeons, held at Chicago, in October, 1897. In this I pointed out that damages were occasionally recovered from corporations for the effects of disease that had existed many years before the occurrence of the accident in which the plaintiff testified, under oath, he had received the injuries for which he was claiming damages[1]. In the first case, a brief abstract of which occurs in the paper to which reference has been made, a man, two years after having been thrown out of his berth in a Pullman sleeping-car, obtained a large sum of money from a railroad for wasting of the right leg below the knee. Some time after the claim was paid, it was ascertained that the man had suffered from poliomyelitis in childhood, and that the muscular defect dated back many years prior to the occurrence of the accident in which he claimed to have been permanently injured.

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[1] The Journal, April 28, 1897.

The second case occurred in the person of a traveling salesman, who was severely shaken up in a railroad accident, July 30, 1892. One or two years subsequently he sued the railroad and was awarded $7000, on account of paralysis agitans, from which he suffered at the time the suit was brought. The history of the man showed that in 1880 he was thrown from a carriage and six years later, or in 1886, the right hand and arm began to be affected by a rhythmic tremor, which was fine, most pronounced after exhaustion, but momentarily disappeared on moving the arm. This was a case of paralysis agitans dating from 1886, instead of from 1892, the date of the accident.

How are we to determine whether the occurrences of certain diseases date from the time of the accident in which a person alleges he was injured, or whether the lesion had its origin years prior to the accident? The only absolutely safe rule in these cases is for the railroad surgeon, oculist, physician and neurologist to make a careful and systematic examination of the injured as soon after the occurrence of the accident as possible. Persons who are severely injured are very anxious to receive the best possible medical attention soon after the occurrence of the accident, and at these times they are very communicative and are eager to give the attending physician or surgeon all the information that they can concerning their personal history. In the first case to which reference has been made in this paper, the presence of muscular atrophy and reaction of degeneration, a few days after the occurrence of the accident, when the railroad surgeon was first consulted, would have been conclusive proof that the muscular defect antedated, by months or years, the injury to the leg. In the second case, the peculiar position in which the body and limbs are held in paralysis agitans would have enabled the medical examiner to make a diagnosis.

A carefully gleaned history at the time of the accident will often reveal the fact that the subject had been hysteric, neurasthenic, or a sufferer from intrapelvic trouble prior to the injury from which all the patient's suffering may be dated subsequently to the accident, or at the time the suit for damages is instituted. Having satisfied ourselves that the symptoms of the alleged injuries have been developed subsequently to the accident, the next points to be determined are: Is the person suffering from any demonstrable organic lesions of the central nervous system? Is the disease neurasthenia, hysteria, or is it feigned?

The time at my disposal for the consideration of these important questions is far too limited to enable me to give more than a mere outline of the methods which I pursue in the investigation of these cases.

Is the patient suffering from any demonstrable organic lesion of the central nervous system? This, as a rule, is not difficult to determine if a thorough and systematic examination is made of all the organs of the body, but especially of the entire nervous system, followed by other examinations, when the first has failed to define the meaning and importance of all the symptoms.

In our examinations, we must bear in mind that a person may be suffering from an organic lesion of the nervous system, and at the same time manifest symptoms of hysteria and neurasthenia. Together with these symptoms, others may be present that are evidently feigned. Because a person feigns we must not denounce him as an impostor. In examining persons suffering from real or imaginary injuries of the central nervous system, the last affections to be thought of are hysteria and neurasthenia. Not until exhaustive examination, or examinations, have failed to reveal a single positive sign of organic disease, should we make the diagnosis of hysteria or neurasthenia. It must be remembered and constantly borne in mind in our examinations of the cases under discussion, that the presence of one positive sign of organic trouble is of more importance in enabling us to make a diagnosis of an organic lesion than the presence of a multitude of symptoms, functional in character, in justifying us in excluding organic disease.

There is an array of symptoms which strongly point to the presence of organic disease, but which may entirely be due to hysteria. On the other hand, there is another group of symptoms which often appear hysteric in character that in reality are due to organic lesion of the central nervous system. These affections I shall not attempt to discuss until I come to consider the differential diagnosis between hysteria and certain organic diseases.

TRAUMATIC NEURASTHENIA.

Unfortunately we are all too familiar with nerve exhaustion, nerve fatigue, commonly known as neurasthenia. The traumatic and non-traumatic forms are the most frequent nervous affections the general surgeon and practitioner of medicine, the gynecologist and neurologist have to meet. It is probable that nearly one-fourth of the traumatic nervous affections are neurasthenic in character. If I were asked for one symptom that is found more frequently in traumatic neurasthenia than in the non-traumatic form, I should answer, "lumbago." This symptom may be found in both etiologic forms of neurasthenia, and we often meet with the traumatic form in which it is absent. It must be borne in mind that neurasthenia may be present in hysteria, may be associated with any organic disease, and develop as a result of the profound functional disturbances to which the various organs of the body are subject.

It is unnecessary for me to go into a detailed description of neurasthenia. This affection is attended by a sense of exhaustion and lack of reserve force, but not by abolition of power, sensory and motor, such as we find in hysteria. There is a lessened power of physical and mental endurance. The patient may temporarily show a considerable amount of muscular power, but this is soon exhausted and may be followed by hours or days of increased fatigue. Every outlay in energy is paid for on the part of the patient by hours of suffering and exhaustion. Lack of mental endurance is shown by the fatigue that follows reading or any other mental effort. There is a mental and physical irritability, annoying to the patient, and often exasperating to the physician. There is frequently a sense of great physical and mental depression, often attended with doubt, hesitancy and great apprehensiveness. Sometimes the depression is so great as to make the physician suspect a psychosis, such as melancholia; indeed, it is not infrequently difficult to draw the line between melancholia and neurasthenia with great mental depression. Emotional manifestations, such as shedding tears, and outbursts of laughter, are not infrequent. Most authorities agree that insomnia is one of the most troublesome symptoms of neurasthenia. Pain and hyperesthesia are common symptoms. The pain is most prominent in and around the spinal column, in the neck and in the head, but it may be complained of in almost any portion of the body. Pressure over the painful regions of the spine or areas of hyperesthesia is usually attended by increase of the pulse-rate. In non-traumatic cases the pain is usually most severe in the upper portions of the spine and in the back of the head. In the traumatic ones, the lumbar region is usually the seat of the greatest pain and tenderness. Paresthesia, such as burning, "pins and needles" sensation, crawling, is not infrequent in neurasthenia. While hyperesthesia is common, anesthesia does not occur. If the latter symptom is present the case is looked on as one of hysteria. Central vision is usually normal, but the peripheral fields soon become exhausted, when the fields appear narrowed. Asthenopia is usually present. Auditory hyperesthesia is a common symptom. The motor symptoms consist of lessened power and lack of endurance for muscular effort continued any length of time beyond a few moments. There is neither paralysis nor contracture such as is found in hysteria. The deep reflexes are increased, the superficial normal, lessened or increased. The trophic changes usually relate to those attendant on general malnutrition. There is nothing in the respiratory changes that is of much diagnostic value. The pulse-rate, on the other hand, is of great importance. This is, as a rule, considerably increased, and is often greatly accelerated on the slightest exertion, or the least excitement. Knapp says: "One of the most striking features of traumatic neurasthenia is in the rapidity of the pulse. In twenty-five cases it ranged from 72 to 140, the average being 95, and in only three cases did it fall below 80."[2]

The principal diagnostic symptoms of neurasthenia are the following: Exhaustion, without complete loss of power; insufficient reserve force to enable the patient to recuperate rapidly after he has been compelled to exert himself, either mentally or physically; intense self-consciousness and a habit of introspection. The patient is cognizant of the perverted function of nearly every organ in the body. Numerous subjective sensory disturbances, mental depression, and apprehensiveness, undue emotional manifestations, irritability and rebellious insomnia are often present. Pain and tenderness over the back; in the traumatic cases it is most intense over the lumbar region; in the non-traumatic, pain and tenderness are most pronounced in the upper region of the spine, at the base of the brain, or at the junction of the spine and skull. There is hyperesthesia and paresthesia, without anesthesia; muscular weakness and fatigue, without paralysis or contracture; narrowing of the fields of vision after exhaustion of any kind, especially after the retina has become exhausted from repeated examinations of the visual fields. Auditory hyperesthesia exists and increased deep reflexes. The accelerated pulse-rate is greatly influenced by exercise, pressure over the tender spots, exhaustion, irritation or excitement. Vasomotor disturbances, such as profuse perspiration over the entire body, or over a portion of it, are not uncommon. It is rare to find a case of neurasthenia unattended by more or less disorder of the digestive organs.

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[2] Nervous Diseases by American Authors. Edited by Dercum, vol. v, 136.

Hysteria and neurasthenia are closely allied diseases. In fact the pathology of each is strikingly similar. In the study of their symptomatology it is impossible to say where neurasthenia ends and hysteria begins. It is probable that the latter is generally preceded by a more pronounced neurotic taint than the former. In other words, heredity plays a more important part in the causation of hysteria than it does in neurasthenia. The neurasthenic is commonly hysteric and the hysteric almost invariably presents some symptoms of neurasthenia. The latter not infrequently passes into hysteria, but typical hysteria never passes into neurasthenia. Hysteria denotes greater disturbance of cerebral function and more evidence of cellular degeneration of the cerebral cortex than does neurasthenia. It is probable that neither case can exist long without some cell changes taking place in the cerebral cortex.

What is the difference between traumatic and non-traumatic hysteria? So far as my limited experience enables me to answer this question, I should say that in the former the character of the accident, or rather the location of the injury sustained, or supposed to have been sustained, by the subject determines to a greater or less extent the location of the pain of which most complaint is made, the seat of the paralysis, contracture or anesthesia.

For diagnostic purposes, if we take the symptoms of neurasthenia, a short abstract of which is given in this paper, and add to them the stigmata of hysteria, such as hemianesthesia, spots of anesthesia, the tender points, the various and varying forms of paralysis, contracture and "crossed amblyopia," with contracted fields of vision, we would have a typical case of hysteria. It must not be forgotten that it is exceedingly rare, in this country, at least, to meet with a case of hysteria in which all the stigmata or ear-marks of the disease, are present. Especially is this so in regard to the paroxysms of hysteria. The latter are not classed among the stigmata of the disease, but among the general phenomena of only a certain group of cases.

The following are some of the principal diagnostic points of the stigmata of hysteria[3].

HYSTERIC ANESTHESIA.

1. In hemianesthesia the loss of sensation is often profound, extending from the crown of the head to the sole of the foot—this is rare in organic disease, but does occur in certain lesions.

2. The reflex action of the skin over the anesthetic areas is normal or nearly so—not so in organic disease.

3. The pupils dilate when the skin of the neck of the anesthetic side is irritated—in organic disease with anesthesia of the skin over the neck, the pupils do not dilate when the skin is irritated.

4. The fingers of the anesthetic hand can still be used, without the aid of sight, in the performance of fine and dexterous movements—if the hand is anesthetic from an organic lesion, delicate movements of the fingers can not be accomplished without the aid of sight.

5. When the arm or leg is affected, the anesthesia may cease abruptly at the wrist, or ankle, at the elbow or knee, at the hip or shoulder or between the joints. This is known by the names of the glove and stocking anesthesia—this is only found in a few organic lesions.

6. The ovarian tenderness is often greater on the anesthetic side. The other tender spots on this side

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[3] Eskridge on "Hysteria"; Sajous' Annual and Analytical Cycloped. of Prac. Med., vol. iii.

persist, notwithstanding that analgesia over all other portions of this side is profound—this is contrary to what we find in organic disease of the nervous system.

7. The loss of sensation may extend up to, or just beyond, the median line in front, but may not reach the median line in the back. In some cases the loss of sensation does not extend up to the median line either anteriorly or posteriorly—in organic disease the anesthesia follows the course of the distribution of the nerve-supply.

8. The anesthesia may come on suddenly, as from traumatism; it may develop or increase after a hysteric paroxysm; it may increase during the examination, especially if a suggestion to that effect is made, and it often increases at the menstrual period; it is frequently changeable from day to day, and may be transferred from one side to the other, especially by the use of suggestion, or by the application of magnets—the opposite holds good in anesthesia from organic lesions.

9. The anesthetic area ends abruptly—the same thing is found in some cases of syringomyelia.

10. In hemianesthesia there frequently is a condition of "crossed amblyopia," the eye most affected being on the side on which sensation is lost—I have never met with this combination of symptoms from organic disease of the brain.

HYSTERIC HYPERESTHESIA.

1. The areas of increased sensitiveness are often ill-defined, changeable and may be bordered by areas of anesthesia—this is not found in organic disease.

2. Deep-seated tenderness, or the hysterogenic zones are most pronounced on the anesthetic side—not so in organic disease.

3. When the pain and tenderness are superficial, deep and steady pressure, especially over the spine or ab-

domen, may give a sense of relief, after the excitement caused by the contact of the hand has passed away—rarely true in organic disease.

4. The painful joints may show no local changes, nor any other evidences of organic disease, and the patient is very averse to the slightest movement of the affected joint.

POINTS IN DIAGNOSIS OF HYSTERIC EYE AFFECTIONS.

1. If vision is lost or greatly lessened, the patient acts as though she does not see, yet by the proper tests it may be demonstrated that she does see—not so in organic affections.
2. In "crossed amblyopia" the worst eye is on the side corresponding to that on which anesthesia is situated, with or without paralysis or contracture, but the face is not affected by any disturbance of its motor power—contrary to what is found in organic disease.
3. In homonymous hemianopsia both corneæ are anesthetic—such a condition of symptoms does not occur from organic brain lesions.
4. In dyschromatopsia blue may disappear before red.
5. In achromatopsia everything appears gray.

DIAGNOSTIC POINTS AMONG MOTOR PHENOMENA OF HYSTERIA.

1. In aphonia, etherization of the patient, or faradization of the throat will cause her to speak. Talking during sleep may occur, and singing is possible in many cases. The aphonia may come on suddenly from emotional disturbances, or from traumatism. Paralysis of the vocal cords is always bilateral in hysteria; unilateral paralysis of these cords is always due to organic disease. The aphonia usually disappears suddenly.

2. In hemiplegia the face is not paralyzed, although it is often anesthetic on the side corresponding to that of the hemiplegia—it is probable that in a few cases the face is paralyzed in hysteria, but the general rule as above stated holds good; we must be careful not to mistake spasm of the muscles of one side of the face for paralysis of the other side.

3. The leg is dragged or shuffled, the foot is not swung outward in bringing it forward, and the toes do not catch on the ground or floor, as is the case in hemiplegia from organic brain disease.

4. The nutrition and electric conditions of the muscles are well preserved.

5. The deep reflexes may be normal and the plantar absent on both sides. If the former are increased, as is often the case, the difference between the two sides is not great. Absence of the plantar reflexes on one side rarely occurs in hysteria. Typical ankle-clonus which persists for several seconds rarely occurs. In organic disease producing hemiplegia both knee-jerks are often increased, but greatly in excess on the hemiplegia side.

6. On testing the strength of the flexor muscles, best observed in the hands, there is abnormal contraction of the extensor muscles. (Gowers.)

7. The flexor contraction of the hand is not lessened by forcibly flexing the wrist, as occurs in organic disease in which contracture has resulted.

8. Ptosis of hysteria is not due to paralysis of the levator muscle, but to spasm of the orbicularis, and the spasm is increased on requesting the patient to look up. If the ptosis is bilateral the head is thrown backward on trying to look upward. If the head is held by some one the patient attempts to look upward, both orbiculares contract. (Gowers.)

9. The ataxic gait is exaggerated beyond that of organic disease, and has the same psychic character as the muscular movements of the hysteric convulsions.

10. Astasia-abasia, inability to stand or walk, although the legs are moved well while the patient is lying in bed, is always presumptive evidence of hysteria.

11. The tremor of hysteria usually ceases during repose if the patient thinks that she is not watched, but it sometimes continues while the patient is sitting or lying. Voluntary motion increases the tremor. If the patient is requested to touch a small object with a finger of one hand, little difficulty is experienced in doing this, but after the finger has been in contact with the object a short time, irregular jerky movements of the arm begin, differing from the tremor of disseminated sclerosis, in which great effort is frequently required in bringing the finger in contact with the object, but this accomplished, the tremor ceases immediately. (Buzzard).

It is probably safe to say that paralytic incontinence of urine and feces, rarely, if ever, occurs, except possibly during the apparent semiconscious condition, following a severe paroxysm in which convulsions have been prominent. Therefore the presence of incontinence of either the bladder or bowel should excite suspicion of organic disease.

POINTS IN DIFFERENTIAL DIAGNOSIS OF HYSTERIA.

In the vast majority of instances the diagnosis of hysteria is comparatively easy if one is familiar with all the "ear-marks" of the disease. Much precision and certainty is lost to that physician who regards hysteria as a protean disease, without constant and characteristic symptoms. While it is true that on superficial observation the symptoms of hysteria at times may appear to mimic those of nearly every organic lesion of the nervous system, viscera, and joints, yet, by a careful study of it, especially of the stigmata, their onset, course and duration, it will be discovered that hysteria is a definite and distinct disease with its own laws and clean-cut symptoms, and that the mimicry is but so in appearance. It must never be lost sight of that hysteria and organic disease may be associated. The two diseases may exist in the same person at the same time. Indeed, in one who is strongly predisposed to hysteria the development of organic disease will give rise to this affection. In such cases it is important to bear in mind that the pronounced and more obtrusive symptoms of hysteria may, and frequently do, overshadow, if they do not entirely obscure, the indistinct symptoms of organic disease. A failure to recognize this fact is, I am quite confident, to blame for many mistakes and not a few blunders that I have encountered in the practice of some excellent physicians.

The first duty of the physician on meeting with a case that seems to be hysteric in character is to determine, if possible, by repeated, thorough and systematic examinations, whether or not there is any organic lesion present. The presence of a multitude of symptoms, all pointing to hysteria, is not sufficient to rest a diagnosis on, if there is one symptom that positively indicates an organic lesion.

Cortical Lesions of the Brain.—Paralysis and anesthesia of the distal portion of a limb from a cortical lesion should never cause any difficulty in the diagnosis from hysteria, unless the patient is also the subject of the latter disease; yet I have seen cases in which this mistake has been made, in one instance, too, by a neurologist of no mean ability. In the first place there is absence of the stigmata of hysteria. The paralysis and anesthesia begin gradually, and the latter is rarely ever profound or extensive. If the lesion is irritative and attended by contracture, muscular wasting will occur. The spasm is at first limited and Jacksonian in character. The deep reflexes of the affected limb are excessively increased, while those of the other limbs may remain normal or nearly so. Soon other symptoms of organic lesion, especially choked discs and evidences of intracranial pressure, develop. The reverse of all these symptoms obtains in hysteria. In the event that the patient were hysterical the presence of the positive symptoms of a fecal lesion of the brain would make the diagnosis clear.

Cerebellar Tumor.—Most of the cases of tumor of the brain that have been mistaken for hysteria have been located below the tentorium. I have one such case under my care at present. This patient was treated eighteen months for neurasthenia and hysteria. It is fair to state that she comes of hysteric stock, and had the most prominent of the stigmata, even to the paroxysmal symptoms. A careful history, which revealed the fact that certain symptoms pointing to organic disease began gradually eighteen months ago and has since slowly, but steadily, increased, together with unilateral facial paralysis and double choked discs, make the diagnosis easy.

Hemianesthesia from Brain Lesion.—This is extremely rare unless associated with some motor disturbance. The deep reflexes, especially the knee-jerk, are increased to greater extent than is found in hysteria; hemianopsia will likely be present, and the special senses on the hemianesthetic side are less affected. In hysteria there is probably "crossed amblyopia." The hemianesthesia that occurs in alcoholism and in some cases of metallic poisoning, especially from lead, is evidently hysterical in its nature.

Hemiplegia.—The paralysis of one side of the face; the state of the reflexes—the deep excessive, and the superficial slight, or abolished, on the paralyzed side; the absence of "crossed amblyopia;" or profound affection of the special senses would exclude hysteria as the cause.

Hemianopsia.—If due to organic brain lesion in the occipital lobe, this may be the only symptom, except, perhaps, pain in the head. It is not changeable and persists for a long time, if not for life. In hysteria it is transient, changeable, the other fields are narrowed, the conjunctivæ of both eyes are anesthetic, the color-fields are probably reversed, and other stigmata of hysteria are present.

Paraplegia.—If due to myelitis affecting the lumbar region, paralysis of the anal and vesical sphincters, the loss of the reflexes, muscular wasting, bed-sores, and the reactions of degeneration would stamp the nature of the trouble. If the cervical cord or the lateral columns were the seat of the lesion, the exaggerated reflexes with true ankle-clonus and other evidences of organic disease would serve to determine the character of the trouble. In poliomyelitis, the muscular wasting, loss of reflexes, and the reactions of degeneration would exclude hysteria as the cause of paralysis. Syringomyelia has many symptoms in common with hysteria, but the muscular wasting, often the weakness of sphincters, the changes in the reflexes, and the absence of the stigma of hysteria would be sufficient on which to base a diagnosis. Multiple neuritis presents organic changes, as shown by reflexes, wasting, and the reaction of degeneration.

Disseminated Sclerosis.—Buzzard says: "Multiple sclerosis, like hysteria, is common in women at puberty; a history of some moral shock often precedes both; there are few cases of multiple sclerosis in which there are not hysterical symptoms added; and many symptoms of the former have long been looked upon as hysterical." The same writer states that the plantar reflexes are usually well marked in multiple sclerosis, and feeble or absent in hysteria. Paralysis is usually sudden in its onset, and more complete and flaccid in the latter than in the former. When blindness occurs in one eye, it is generally complete at first and comes on suddenly in hysteria, whereas in multiple sclerosis absolute blindness in one eye is rare. In the latter the acuity of vision lessens gradually with contraction of the visual fields, until the eye is almost useless; then vision improves in this eye and fails in its fellow. Atrophy of the optic nerve and nystagmus occur in multiple sclerosis, but are probably never of hysterical origin. The tremor of multiple sclerosis may be simulated by an irregular tremor occurring on voluntary movement in hysteria, but in the latter the excursions are usually less; there are a tardiness of the initial muscular effort and a contraction of the antagonistic muscles. Gowers lays considerable stress on the diagnostic importance of the presence of the last symptom. The hysterical patient affected with tremor will often touch a small object with the index finger without much difficulty, but after the finger has remained a few seconds in contact with the object the arm becomes affected with an irregular jerky tremor, differing from the tremor of disseminated sclerosis, in which great effort is frequently required in bringing the finger in contact with an object, but as soon as this has been accomplished the tremor ceases.

Neurasthenia.—Theoretically the difference between hysteria and neurasthenia is well marked. The former is a disease with its stigmata and paroxysmal symptoms, all or any of which may come on or end suddenly; the latter is an exhausted state of the nervous system, without complete loss of power in any direction, having a gradual beginning and ending and unattended by stigmata or paroxysmal symptoms. Practically, however, hysteria is a psychoneurosis, and neurasthenia, while it may begin as a simple neurosis, frequently becomes a neuropsychosis. Nerve exhaustion in a person who is predisposed to hysteria may cause the development of the typical symptoms of the latter disease. In cases in which hysteria and neurasthenia are associated a careful study of the manner in which individual symptoms have developed will usually enable one to determine which is the primary malady.

FEIGNING.

If the examiner understands his business and is careful and systematic in his examination, it is next to impossible for the maligner successfully to feign organic disease of the central nervous system.

It is exceedingly difficult for a maligner to simulate neurasthenia until he becomes, to a certain degree, neurasthenic himself. It is probable that a clever one may subject himself to a course of training that will ultimately lead to the development of neurasthenic symptoms. This probably can be done by insufficient food, anxiety, and a constant endeavor to simulate the disease for a considerable length of time, when the strain will begin to tell on the nervous system. In most of such cases, however, everything will be so exaggerated that the feigning will be apparent. Unless the patient is actually neurasthenic he can not simulate the rapid pulse, the influence of exercise on the heart, the local sweating, and the general symptoms of exhaustion. It must be remembered that in most cases of true neurasthenia there is, after a time, some exaggeration of symptoms.

In most patients I have met with hysteria, there has been an exaggeration of some symptoms. In this disease the suggestibility and impressionability of the patient are enormously increased. In cases that are under litigation, unless great tact is used by the examiners and the attorneys for the plaintiff and defendant, a mild case of hysteria results in great exaggeration of some symptoms and the feigning of others. It is a comparatively easy matter to distinguish between a case of simple feigning and hysteria. The stigmata of the disease can not be successfully feigned, except by an intelligent physician, and a clever trained nurse who may be conversant with all the symptoms of the disease. Given a case of genuine traumatic hysteria, with the prominent stigmata well marked, it is not always an easy matter to say, in suspicious characters, just to what extent intentional feigning enters into the manifest symptoms.

In the discussion of the points in the diagnosis of traumatic injuries of the central nervous system, my paper has grown larger than I had intended, yet, I have left many important points untouched, and those that I have tried to make prominent I have failed to make as clear and easy to the railroad surgeon as he and I wish it might have been done, in this most difficult subject in the whole range of differential diagnosis.

DISCUSSION.

Dr. E. W. Lee, Omaha, Neb.—The cardinal point of the paper of Dr. Eskridge, which has been so forcibly impressed on us, is that there is a tendency, when we examine neurotic patients, to make a diagnosis of hysteria before we find any true organic lesion. This is particularly true of a great many general surgeons and railway surgeons, and when a case of medicolegal importance is brought to them they are liable to consider the case as one of hysteria before they find any positive evidences of it. We know that there are many malingerers, people who are trying to get compensation out of corporations and are not entitled to it. It is natural for us to look on such patients as feigning, and the important point brought out by the essayist is this, that thorough, repeated and careful examinations should be made, and, if possible, we should discover some organic lesion before designating the case one of hysteria.

Dr. L. E. Lemen, Denver, Colo.—I wish simply to make a suggestion. The Union Pacific and the Denver and Rio Grande railroads, of which Dr. Eskridge is neurologist, are the only two roads that I know of in the country who have appointed neurologists. I saw the absolute necessity of having some competent man outside of a general railway surgeon to aid me in that line of work, and I must say that I have derived a great deal of benefit, as well as has my corporation—the former road—from his appointment. It is true, the management of the road did not see the necessity of it when I first made the suggestion, but after I had called attention to the salient points which would come from the appointment of a neurologist, the appointment was made.

Dr. D. S. Fairchild, Clinton, Iowa—I have had considerable experience in examining cases for settlement and preparatory to trial when a settlement could not be reached. There is one point, which was made by Dr. Eskridge, that is of great importance, i. e., the examination of a patient as early as possible after the accident has occurred for the purpose of determining the existence of organic disease which may have been present before. He has pointed out the fact that changes which take place in the nervous system as a result of organic disease do not show themselves for some little time thereafter. If we make an examination early, we can determine with a reasonable degree of certainty whether such changes occurred before or subsequent to the accident.

The essayist has pointed out the difference between organic lesions and hysterical and neurasthenic conditions. This is a matter of very great importance, for there are many practitioners of surgery who, in their examinations of these patients, are unable to make these distinctions, and it is very fortunate that Dr. Eskridge has directed our attention to some of the most important points. I have been associated more or less with neurologists in making these examinations. I have also read much of what neurologists have said and written and I have gained the impression that there is a certain class of special pleaders for patients who have claims against railroad corporations. I have seen so much of this as to lose confidence in the opinions of many neurologists. Not long ago I had an opportunity of examining a patient in whom a so-called neurologist contended that extensive lesions might occur in the spinal cord without giving rise to any objective signs whatever; that the reflexes may be in a perfectly normal condition, and yet there may be extensive inflammatory foci in the spinal cord. This was new to me. The gentleman said he had made a number of post-mortem examinations, and had exhibited slides showing the condition of the spinal cord in cases where there had been no objective symptoms whatever.

Another point which might be taken into consideration here, especially in women, is the existence of pelvic troubles that give rise to neurasthenic symptoms which are attributed to an accident or injury when such injury occurs. Not long since I examined a patient in whom an injury, at the beginning, of a different character was alleged. The patient had sat violently down on the floor of a car, and claimed to have fractured the coccyx. For a long time the claim was based on this condition, but as no objective signs of this fracture could be elicited the claim was abandoned, and a suit subsequently instituted in which either neurasthenia or spinal cord lesions of a very general and indefinite pathologic basis were offered, and when the case came up for final examination the neurologist, to whom I have referred, stated as his belief that there were inflammatory points in the spinal cord, and when asked to produce evidence for these lesions, he was unwilling to point them out, and simply presumed on the information of other fellows who were associated in the case. He asserted that he had seen a number of patients in whom there were focal points of inflammation, in which the deep reflexes were not affected in any way, who, were incurable, and which made the case hopeless.

Dr. John E. Owens, Chicago—While I have not very much to say on this paper, I should regret very much to have it pass without expressing my appreciation of its value to the Academy. I do not believe that surgeons, as a rule, are experts in neurologic fields, and when diseases of this class present themselves to us, it is very essential for us to call competent neurologists to our aid. In other words, the head of no practitioner in this country is large enough to take in all branches of the practice of medicine. The idea that it is has long ago been laid aside by the thinkers in the medical profession, and the appointment of gentlemen representing this field of work in connection with our railroads is a step in the right direction. We certainly very frequently have to avail ourselves of their services in discussing these cases. This paper culls from the monumental work of the neuropathologists and narrows the borders of the subjects which we, as practical surgeons, are the most interested in, that is, those cases of nervous aberrations that grow out of real and alleged surgical injuries. It places the matter within our grasp. When it is published in our Transactions, it will be very convenient for us to refer to it, as I shall do, in studying the differential diagnosis of the various nervous aberrations which we have to meet.

SIMPLE DEVICE FOR RAPID HYPODERMOCLYSIS IN COMBATING SHOCK.

BY EVAN O'NEILL KANE, M.D.
SURGEON, P. & E. AND P. & W. R'YS.
KANE, PA.

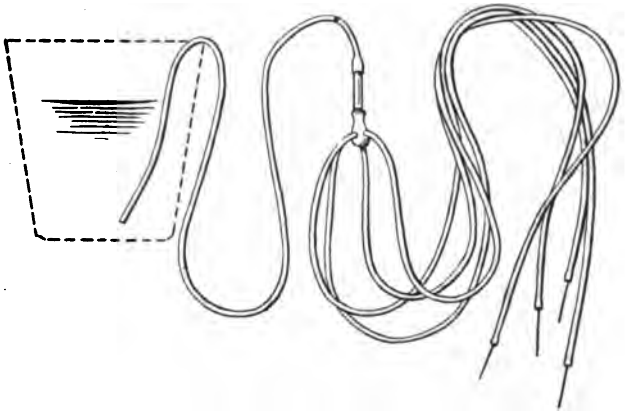
All who have tried to administer an intravenous infusion must be aware how difficult a procedure it is under adverse circumstances. It is practicable and safe with suitable aseptic surroundings, a fairly aseptic skin and moderately well-filled vessels. The case is quite different as generally seen by the railroad surgeon when his patient is in shock, in a caboose, freight car, shanty or crowded boarding-house, amid the fumes of tobacco, foul exhalations and dust, with an unwashed skin begrimed with cinders and grease, and with the veins collapsed from hemorrhage. Any one who has made the attempt knows the difficulties. It is for this reason that hypodermoclysis commends itself in emergency work.

The principal objection to hypodermoclysis has been that it is too slow in action where prompt results are demanded. Half an hour is necessary for the instillation of from a pint to a quart—too long a time in a serious case of shock. To obviate this difficulty I have devised a simple apparatus with which four or more needles may furnish fluid to the tissues at the same time, from a single receptacle. Anyone with the slightest amount of mechanical ability can construct the apparatus in a few moments, without trouble and at a trifling expense. He will require an ordinary rubber-bulb glass medicine dropper, five yards of fine rubber tubing, such as is used for nursing bottles, four extra hypodermic needles or fine aspirating needles and a wire hairpin. The whole appliance can be sterilized in a few minutes by immersion in boiling water. Any clean bowl, bottle, pail or other vessel of sufficient size will answer for the receptacle that will contain the normal salt solution.

The construction is as follows: Into one end of three feet of the rubber tubing—the end which is to serve as a siphon—is inserted a wire hairpin to act as a stylet in retaining the tubing in the proper curve to hang over the edge of a vessel. The pin must have first had its curve altered to a more obtuse angle to prevent kinking of the tubing. A few short crooks along each fork will prove of advantage by preventing its sliding through the rubber tubing when subjected to tension. By this device is secured a firm and properly curved siphon which can, by bending the pin more or less, be made to fit over the lip of any vessel. The length of the short arm of the siphon can be increased or diminished to just reach the bottom of a vessel of any depth, by merely sliding the wire a greater or less distance along the tubing.

Into the other end of the yard of tubing is inserted the nozzle of the dropper, the tip of which, if too small, should be broken off where it is wider. In the rubber bulb of the dropper are cut four openings, each a little more than half the diameter of the tubing. Two lengths of rubber tubing, each two yards long, are now drawn through the holes in the bulb, at right angles, half their length, so that a foot and a half hangs out on each side. I should add that a notch should first have been cut in the middle of each tube to be drawn, notch upward, fully inside the rubber bulb. Finally to the open ends of the rubber tubing are attached the four hypodermic needles.

An apparatus with four needles can readily introduce from two to four quarts of fluid into the tissues in half an hour. The amount will depend on the size of the needles, the elevation of the receptacle and the thickness of the cellular tissue. A much larger amount of fluid can be introduced if more needles are employed. In order to show how we may increase the number in one apparatus, I show one here which, by additional branching from the four terminal points, supplies ten needles. I have not, however, for practical purposes, found it necessary to use so large a number. One can conveniently insert a needle into each loin, and one below each scapula, on each side of the abdomen or under the breasts. It is well to change the location of the needles slightly from time to time, to prevent overdistension of the tissues.



To start the current through the siphon, suction should be made through one of the needles, the points of the others being closed by the finger and thumb. As a precaution against possible sepsis, it might be well to make the suction indirectly through the clenched fist.

In urgent cases I elevate the receptacle five feet, but this is objectionable on account of the pain and soreness produced by so forcible distension. The smaller the needles and the less the degree of elevation, the less will be the pain to a conscious patient. The rapidity of the infusion will be correspondingly slow.

When the patient is suffering from shock—usually due to great loss of blood in railroad cases—the surgeon may set the apparatus in action in a few moments, and leave it almost without further attention, while he and his assistant are employed about the various steps of the operation.

I carry an infusion appliance in my emergency surgical case, and another in my obstetric bag—I have more than once saved women in postpartum hemorrhage by its prompt use—while a third is kept hanging in position in my hospital operating-room.

Hypodermoclysis can not act on the heart as instantaneously as if the veins or arteries are filled directly, but the simplicity of application and the greater safety to the patient more than outweigh the slight difference in time in most cases. I question, indeed, whether the additional time required in properly isolating the vessel, etc., does not occupy a greater amount of time even when one has every convenience at hand. There are but few railroad surgeons, too, whose experience with intravenous infusion has been sufficient to warrant them in searching for, and attempting to open, a partially collapsed vein amid the hurry and confusion attendant on most railroad work.

DIAGNOSTIC VALUE OF THE DEEP REFLEXES OF THE LOWER EXTREMITIES.

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The diagnostic ability of railway surgeons is not infrequently taxed to its utmost in determining the real facts in cases of alleged organic disease of the spinal cord in which paralysis is presented as a symptom. The forms of paralysis complained of are either motor or sensory, or both. Spastic forms, with or without trophic conditions, may be left out of consideration for the present at least, as they present features which make them easy of recognition.

In a case of motor or sensory paralysis, or both combined, the questions which will enter the mind of the examiner are three in number: 1. Is the paralysis due to an organic change in the anterior or motor side of the spinal cord, or both in anterior and posterior sides, or are the lines of communication impaired or destroyed by injury to, or disease of, the afferent or efferent nerve-fibers, or both? 2. Is the paralysis hysterical in character? 3. Is the paralysis feigned?

These questions can be correctly answered if the examiner is familiar with neurophysiology and neuropathology, and makes the examination with the care which such cases demand. Without entering into details we may observe that there is, physiologically considered, a continuous line between the sensory nerve ends on the one side to the motor end plates in the muscles on the other, which constitutes what is known as the reflex arc, and consists of the sensory or afferent nerve-fiber, the gray cells of the spinal cord and the motor or efferent nerve-fiber. If any part of this arc is broken, the reflex is interrupted.

This paper was suggested by a patient who recently came under my observation, and by an article from the pen of Dr. Charles K. Mills,[1] on "Some Points of Special Interest in the Study of the Deep Reflexes of the Lower Extremities." The patient referred to was a young, married, Polish woman, who received an injury from being thrown out of a buggy while attempting to cross a railroad track. The horse took fright and backed off an embankment. The woman walked a short distance to a house, merely with a little assistance, rode nineteen miles more that day, twenty the next, and seven the third day. She then went to bed and remained there four months. After that time she was able to sit up a few moments at a time for three months more, when she came up for special examination. There was but little variation in the symptoms, except that the physician in attendance noted an occasional rise of temperature and a variation of pulse, which in general was rapid.

At the time of examination, the temperature was 99.6, pulse 116. The next day the temperature was 98.5 and the pulse 80. She alleged complete motor and sensory paralysis in the left leg, also great pain in the paralyzed

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1. Journal of Nervous and Mental Diseases. March, 1899.

one. The area of alleged anesthesia extended from a point over the second lumbar vertebra directly in a line to a point above the superior spinous process of the ilium, then down along the pelvic brim to the symphysis pubis; all points below this line were anesthetic. The tendon reflexes were normal, and also the ankle-clonus on both sides. Measurements showed no difference in the size of the legs, and the electric reactions were the same in both. The muscles were also equally firm in both. As monoplegias the result of trauma are practically unknown, it became interesting to determine, if possible, the pathologic condition. The paralysis was alleged to be complete, including both motion and sensation. If it was due to organic disease, it was assumed that the deep reflexes would have been abolished and certain trophic changes found in the nerves and muscles of the paralyzed limb, which was proved not to be true. It was claimed, by one of the examining physicians, that the injury did not involve the spinal cord, but was a pressure lesion involving the lumbar nerves. Had this been true, and all communication cut off with the spinal cord through this plexus, the tendon reflexes would have been destroyed on account of the involvement of the crural nerves, while the ankle-clonus would have remained present on account of the communication with the spinal cord through the sciatic nerve derived from the sacral plexus. Furthermore, the anesthetic areas and motor losses would have corresponded to the distribution of the nerve-supply derived from the lumbar plexus—the anterior crural nerve—but as the paralysis was equal and complete on the anterior and posterior surfaces of the thigh and the leg, the theory was inconsistent and could not be considered. In addition, on walking, the paralyzed leg did not drag, but was lifted with slow deliberation. We were left to conclude from the facts that the paralysis was hysterical or feigned. We sought for irregular areas of anesthesia and other evidences of hysteria, but these were absent.

The value of the deep reflexes in the diagnosis of organic spinal cord disease is based on the proposition that if the anterior horns of gray matter are involved in a destructive lesion the motor response to stimuli is impaired or abolished, although it is observed in neuropathic muscular atrophy that the reflexes often remain until the disease has reached an advanced stage, although they have become greatly reduced and finally disappear. This is true of any form of anterior myelitis.

In locomotor ataxia the deep reflexes disappear early, and as a rule the continuance of the reflexes may be taken as evidence that the disease is not this affection, although in rare cases the reflexes may be present after other evidencs of ataxia have appeared, as the Romberg symptom. I have recently had an opportunity of examining a case in which the Romberg symptom was present, and also the patellar tendon reflex; there had never been any lightning pains, and the pupil reflexes were active. In these cases it may be assumed that the lesion occurs very low in the cord and does not early involve the lumbar region.

It must be assumed that, both on a physiologic and pathologic basis, if the disease is of an inflammatory or degenerative character, and is confined to the anterior or posterior horns, the deep reflexes will slowly or abruptly disappear; the same would be true if the nerve-fiber communication with the cord were cut off. In general terms it may be contended that a disease of an inflammatory or degenerative character confined to the spinal cord alone and of sufficient extent to involve a complete motor and sensory paralysis, will lead to an abolishment of the deep reflexes of the lower extremities.

It is true that a mixed degenerative change may for a considerable time involve exaggerated deep reflexes which may suddenly or gradually disappear when the gray cells in the anterior or posterior horns become extensively involved or, again, a degenerative spinal cord disease characterized by exaggerated reflexes may present the phenomena of abolishment of these reflexes by a later involvement of the motor or sensory side of the cord. This is illustrated in a case with which I was connected. A patient suffering from spastic spinal paralysis manifested the special symptoms of this disease for several years, but was able to walk about, however, with some difficulty. She was abruptly seized with a chill followed by a temperature varying from 102 to 104 F., and became helpless so far as the lower extremities were concerned. The exaggerated reflexes disappeared; in fact no ankle-clonus nor patellar tendon reflexes could be excited. The fever continued about ten days, and she improved somewhat in general health, but she could not walk, although she could move her legs in bed by an exercise of the will; yet motion was weak. I saw here three weeks after the attack above referred to. It was our opinion that an anterior myelitis had occurred in the lumbar cord, cutting off the response to reflex stimuli. We may admit in this case the influence of toxins developed in the course of the disease and exercising a paralyzing influence on the cells of the cord.

In acute myelitis the grouping of symptoms is too wellmarked to lead to an error of diagnosis, but the deep reflexes are quickly abolished. On the other hand, chronic myelitis is marked by the exaggeration of the reflexes. In this disease the development is slow, and as it involves the lateral tracts as well as the anterior and posterior, and not any of these to a destructive extent, at least for a considerable time, we may have certain mixed symptoms among which will be found the exaggerated deep reflexes. In the progressive muscular atrophy of Aran Duchenne, it has already been observed that while the reflexes are not always at once abolished they soon become weakened and generally disappear; on the other hand, in the mixed or amytrophic forms, the reflexes are greatly increased, due to the involvement of the lateral tracts; hence the reflexes are of great value in distinguishing between the two diseases. It may be contended that the deep reflexes are of great value in distinguishing between primary lesions occurring in the anterior or posterior horns, as in the anterior myelitis, and locomotor ataxia from mixed lesions, as in spastic spinal paralysis or multiple sclerosis.

It may be said, however, that there are alleged forms of degenerative or inflammatory lesions of the cord, which are of an indeterminate character without symptoms, which I have only seen or heard of except in litigation cases where serious lesions of an organic nature are said to exist, which only learned neurologists can discover, and which have wisely never been put on record. I am persuaded to believe that only minds of peculiar constitution and of great refinement can understand or appreciate this class of lesions. Whether these lesions ever occur except in spinal cords injured by corporations I am at a loss to know. I have recently been informed, in considering a case, that quite extensive lesions of an inflammatory character, occurring in patches, gave rise to no symptoms whatever during life, and that they might exist, and did exist in the particular case, and not affect the deep reflexes. I was advised that these observations had not been published.

Some interesting observations have been made by Dr. Mills in relation to localized lesions affecting the patellar tendon reflex and not the ankle-clonus. These cases are extremely rare; only eleven have been reported of the persistence of ankle-clonus after the patellar reflexes had disappeared. To account for this condition we may consider the fact that the cord center for the patellar reflex lies in the lumbar segments from the second to the fourth, inclusive, corresponding to the origin of the crural nerve. This region of the cord, together with the afferent and efferent nerves, constitutes the reflex arc for the patellar reflex; therefore a focal lesion in this part of the cord will abolish the reflex. The persistence of the ankle-clonus after the patellar reflex is abolished is explained on several hypotheses. The most probable one is given by Dr. Mills, as follows: "On theoretical grounds it seems probable that the syndrome might be due to a focal lesion in the cerebral cortex or in the cortical spinal tract, or to arrested development of the tract associated with disease—inflammatory or degenerative—limited to the crural nerves and their muscles."

The importance of the deep reflexes in the diagnosis of organic spinal cord disease is of limited value and chiefly confined to focal lesions which affect the spinal centers included in the reflex arc, or in the tracts of the cord which have undergone more or less extensive degenerative changes. In locomotor ataxia they are generally abolished, although in some cases where the lesion is confined to the lower segments of the cord, the patellar tendon reflex may persist. In anterior myelitis involving extensive lesions, they are abolished. In localized myelitis there will be considerable variation in this respect, depending on the location of the lesion with reference to the particular reflex arc and the extent of involvement of the cord structures. In neuritis of the crural nerve the knee-jerk is lost, except in the earlier stages of the disease, and this will depend on the intensity of the inflammation. In multiple neuritis the same is true, except that it involves a wider range of reflexes.

In spastic spinal paralysis, amytrophic lateral and multiple spinal sclerosis, the reflexes are exaggerated. In syringomyelia, the reflexes are abolished if the focal lesion is in the anterior horn or in the posterior columns; if in the crossed pyramidal tract, the reflexes will be exaggerated.

In functional nervous diseases or morbid states of the nervous system the reflexes are changed in character. In hysteric paraplegia, according to Gowers and Mills, the ankle-clonus is abolished. The majority of neurologists, however, hold to a different view, contending that in about 20 per cent. of the cases the ankle-clonus is present. Mills is of the opinion that in these cases an organic disease exists obscured by the hysteric symptoms. Mills also contends, from recent observations, that the patellar clonus is absent in hysteria, but admits that "it is not improbable that patellar clonus will be found in those cases of hysteria in which hypertonicity and the diathesis of contracture are present—some cases of spastic and convulsive hysteria; cases of tetany and some cases with choreic and athetoid phenomena."

In pure neurasthenic cases my observation is that in a considerable number the knee-jerk is increased; not exaggerated as in the spastic condition, but merely increased. I have made many observations on this point, both in traumatic neurasthenia and in that not due to trauma, and while there was some modification of the reflexes, I have never found them absent.

The real diagnostic value of the deep reflexes can only be determined by a very careful consideration of the facts in the case, and by a careful study of the reflex itself. There is no certain and absolute guide as to the intensity of a normal reflex. I have examined about 500 presumably healthy men who were applicants for service with a railroad company, and found a great variation in the extent of movement of the leg when the patellar tendon was struck. In about one in a hundred there was no response. In a somewhat larger proportion the reflex could be obtained on reinforcement. In about 4 per cent. the reflex was large and would appear to be exaggerated; indeed, I have heard physicians declare in examining medicolegal cases, that reflexes of the same range were exaggerated, and the reflex was offered as an evidence of spinal cord disease. But on comparing this increased reflex with the exaggerated one of spastic spinal paralysis the difference would at once be seen. Hence, the experience derived from the observation of the reflexes in healthy persons will be an important factor in correcting certain misconceptions which may arise from examinations confined to individuals who are supposed or alleged to be suffering from some spinal cord lesions.

It will be seen that a consideration of the reflexes alone will be misleading in determining the nature of a spinal cord disease, or in distinguishing absolutely between an organic or functional affection of the nervous system, but when taken in connection with the other symptoms will be of considerable value in reaching a conclusion. But, on account of the considerable variation in the normal reflex, they must be studied with great care or the examiner will be led into error regarding the value which may legitimately be attached to them.

DISCUSSION.

Dr. J. T. Eskridge, Denver, Colo.—There are many symptoms on which a diagnosis depends in almost every case, and we are rarely justified in making one on one symptom alone. This is a mistake which is made by too many men. They often rely on one symptom as indicative or symptomatic of an organic lesion. On the other hand, mistakes are made when we have multiple symptoms of hysteria present. A diagnosis of hysteria may be made when there is organic trouble present. Did I understand Dr. Fairchild to say that one leg was paralyzed and the other anesthetic?

Dr. Fairchild—There was sensory and motor paralysis in the same leg.

Dr. Eskridge—I have yet to see the first case in which persistent ankle-clonus has been present in hysteria. Gowers lays stress on this and says that he has never met a typical case of ankle-clonus. Sachs, of New York, brings forward examples in which he claims typical ankle-clonus was present in cases of hysteria. We not infrequently get pseudo-ankle-clonus in this affection, but it is distinctly different from that of organic lesion. If you take distinct ankle-clonus of organic lesion and bend the front of the foot up, the ankle-clonus will persist, and In hysteria, on the other hand, not infrequently, if you take if you increase the pressure you will increase the ankle-clonus. hold of the foot, two or three wave-like motions which are irregular and comparatively voluntary in character will be made, but will not persist, and if you press firmly on the foot, will disappear. To repeat, I have never seen a typical ankle-clonus present in hysteria, notwithstanding the fact that such an eminent man as Sachs reports that he has.

In regard to the paper of Dr. Fairchild, he spoke of persistent ankle-clonus and the knee-jerk being abolished. So far as I know, I was one of the first to make this observation in a clinical lecture, delivered at the Arapahoe County Hospital in Denver, eight or nine years ago. I was a little nonplussed at the time, to explain it; there was positive evidence of inflammation of the lower end of the cord, and the only explanation I could make of it was that we had focal lesion between the lumbar and sacral portions of the cord. In the sacral portion we have the innervation of the muscles that give rise to ankle-clonus, and those that give rise to the plantar reflexes; in the lumbar region we have the innervating center of the muscles that give rise to ankle-clonus. After I had made the diagnosis of a focal lesion between the lumbar and sacral centers, I wrote to Dr. Mills and he replied that he knew of no such case on record, but could not conceive of any other explanation. The patient died from other causes, and at the autopsy we found a focal lesion in the upper sacral portion of the cord. The lumbar region, under microscopic examination, showed the cord was perfect.

In regard to the knee-jerk, in all lesions above the lumbar region which involve the pyramidal tract, it is always increased. If the lower dorsal region is involved and we have a chronic condition which extends to the lumbar region, the knee-jerk will also be abolished. We may have an acute myelitis in the cervical or dorsal region in which the reflexes are abolished, but this is during the period of shock; after a period varying from a few hours to a few days the knee-jerks are increased. In cases of hemorrhage into the brain we will find the limb of the opposite side absolutely flaccid, but as soon as the shock passes away the reflexes return, and temperature goes up on the paralyzed side. When shock is over, in acute myelitis, the reflexes will return. Whenever the lumbar region is involved by any organic lesion, the knee-jerks are absolutely abolished, and it does not take much of a lesion in this reflex arc to produce abolition of the reflexes. If one branch of a nerve is involved in this arc, the knee-jerks may be absent, as, in injury to certain branches of the anterior crural nerve. These will result in complete abolition of the knee-jerk. In this connection we have another condition, i. e., the knee-jerk in healthy persons is not infrequently absent. I have found in a record of several hundred cases of apparently normal persons, that the knee-jerks were abolished in 1 or 2 per cent. of the cases. This does not agree with Erb, who has found it absent in a greater number of persons. Take the knee-jerk of all persons, and we find it absent in at least 1 per cent. In hysteria, the knee-jerks may be normal or increased, just as we find them in neurasthenic patients. Infrequently the jerks may be temporarily lessened or possibly absent in hysteria. I have occasionally found them temporarily absent in neurasthenia, and then again, in subsequent examinations, I have found them present. The innervation of the nerves, or centers in the spinal cord, will modify the knee-jerks, so that I think the observations of Dr. Fairchild in this respect, that no one symptom is to be absolutely relied on in making a diagnosis, are correct. It is only a combination of symptoms that relate to one another that enables us to make a positive diagnosis. The physician who makes a diagnosis on one symptom and regards it as positive evidence of organic lesion is going to make mistakes frequently. There has been one symptom brought forward which may in the future prove of great value to us. The first investigations were made some years ago, by Babinsky, and later the matter was investigated by Collier, of London. I did not mention it in my paper, simply because I wish to have more experience in regard to it. If Babinsky's observations should be confirmed by others, we have a valuable guide in several of those cases under consideration in which the knee-jerk is absent. The symptom is this: When you strike the plantar surface of the foot, if the pyramidal tracts from the cortical to the terminal portions of the nerve are involved, you will have an upward contraction of the foot, most marked in the great toe. This same condition exists in children. If you strike the plantar surface of the foot, when the child is only 3 or 4 years of age, the foot will turn up (illustrating). If you strike the side of the foot of a healthy subject it will almost invariably go down (plantar flexion). I have tried to elicit this symptom in several cases, and it is present in organic disease. It is present in certain cases of insanity, in some cases of neurasthenia, and I do not believe in reporting on it until my observations have been sufficiently extensive to enable me to confirm or differ from conclusions of others. Collier made his observations in the Hospital for the Paralyzed and Epileptics, in London, and gives a report of 300 cases in which he confirms the observations of Babinsky. Some of my friends, who have been making similar observations, have not been able to entirely confirm the views held by these gentlemen.

I have a word or two to say in regard to the subject of syringomyelia. The knee-jerks depend largely on where the syringomyelia begins. If it starts in the upper portion of the cord, which seems to be a favorite seat, the knee-jerks are increased. I have a patient under observation in whom there is incontinence of the bladder and of the bowel. The knee-jerks are absolutely abolished, although in the beginning they were increased. Evidently we have, in this case, the lower portion of the spinal canal distended, and the pyramidal tracts in the lumbar region involved, hence the abolition of the knee-jerks. So much depends on accurate observation in these cases, taking into account other relative symptoms that present themselves, that one is hardly justified in making a diagnosis on one or two symptoms alone. It shows with what care we should investigate all cases before making a diagnosis.

Dr. Fairchild, closing the discussion—I regret that my paper did not elicit more discussion on the part of other members of the Academy. We are presumably all railway surgeons, and all of us have examined the class of cases under discussion and have given our opinions to the claim department in order for it to form a basis for litigation in case that should happen to occur. These nerve lesions constitute the largest number of cases that the surgeon has to give an opinion on, so far as the claim department is concerned.

I quite agree with all that Dr. Eskridge has said, except in one particular. In regard to the indeterminate forms of spinal cord lesion, the Doctor must have misunderstood me a little in some respects, in one particular especially, and that was that these lesions could occur in the cord without giving rise to any symptoms whatever.

TREATMENT OF MINOR TRAUMATISMS.

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The frequency of minor injuries warrants more attention to their treatment than, as a rule, is given. The danger of severe infection from the most trivial wounds warrants our closest attention to this class of injuries.

During the last two years, my records show that I have treated on an average about one thousand minor injuries each year. Among these I have seen some of the most grave cases of infection arise from trivial accidents, so insignificant that those who were afflicted did not think it worth while to go to the surgeon's office and have them cared for, until they found that instead of repairing, they were getting worse, and oftentimes when they would apply for treatment they had already suffered from chill, and septic infection had set in.

A patient who is now convalescing in the Wyoming General Hospital will illustrate this subject. A young man, in the prime of life, ran a small splinter into the thumb of the left hand. He removed the splinter and paid no attention to it until about five days later, when he came in, suffering from rigors, headache and general lassitude, with a furred tongue; on examining the thumb, I found it swollen and inflamed, with a red streak following the line of the lymphatics of the arm to the shoulder, but especially was it noticeable in the forearm. He was sent to the hospital, the thumb was freely lanced, but only a small quantity of pus was discovered. This was evacuated, the wound washed with bichlorid solution and the entire hand, forearm and arm packed in sterilized gauze saturated with bichlorid evaporating solution and covered with christie to prevent evaporation.

Notwithstanding the vigorous treatment which was applied, the arm became intensely swollen, the inflammation extending to the fascia between the flexor muscles of the forearm, causing contraction of the fingers and thumb, which for a time were so painful that it was impossible to straighten them without excruciating pain. As soon, however, as the inflammation had subsided sufficiently, massage was instituted and the fingers and thumb were extended every day, until at the present writing the patient is able to move them and by some effort, and with more or less pain, is enabled to have them nearly straightened. Yet, there is still more or less thickening of the flexor muscles, which in time we are in hopes will subside and the young man eventually get the use of his hand.

This is only one of numerous instances of a similar character where a slight injury has produced the gravest effects. Many of these injuries to the fingers are followed by suppuration, the sepsis not unfrequently of so severe a character as to extend to the periosteum and even be followed by necrosis of the bone, necessitating amputation, usually the result of carelessness on the part of the patient, who became infected before applying for treatment. I regret to say that we have trivial injuries where patients do apply to the physician and surgeon for treatment, and through carelessness and neglect of strict antisepsis the surgeon allows the wound to become infected and the patient is obliged to suffer the consequences. I recall a case of this kind in which a young man, who was scratched with a piece of glass, became infected, and his first medical attendant added fuel to the fire by putting on a filthy flaxseed poultice. The infection extended along the lymphatics of the right arm until it reached not only the axillary but also the subpectoral glands, all of which became not only inflamed but broken down, and we were obliged to remove all the superficial and deep glands, and in operating, we found that the pus had burrowed beneath the pectoralis major muscle to its origin along the anterior aspect of the chest. This young man came near losing his life from a mere scratch, not larger than that made by the point of a pin. It cost him weeks of suffering, besides the general depression which an injury of this kind brings about to the economy. Many physicians are not as fully equipped for caring for this class of wounds as they should be. We also realize that the physiologic resistance in many persons is sufficient to protect them against infection, although it may be present in wounds of a minor character. Yet no one knows the moment this physiologic resistance may fall below par, and infection, such as I have described, follow.

The object of this paper is to impress, more especially on those who have to handle this class of injuries, the importance of treating even the smallest minor injury with the same precaution as though it were a major one. It is true that many of these patients come to the physician or surgeon, no matter how soon they are seen after the accident, thoroughly infected. The nature of their employment is such that it can not be avoided, yet I am convinced, by a reasonably large experience, that there are simple, inexpensive methods by which they can be treated successfully at the physician's office without having the terrible results of septic infection follow such traumatisms.

It has been my aim during the last few years to study how best to treat these injuries in such a manner as to obtain the most satisfactory results with the least loss of time to the patient and surgeon, and the least amount of expense. These are all factors which interest everyone concerned in the treatment of this class of injuries.

I trust I shall not be considered egotistic in presenting my method of treating this class of wounds, in the hope that it may be of some benefit and at the same time call forth discussion which will bring to light the experience of others. The method which I have found to be most satisfactory is to wash the injured parts thoroughly with tincture of green soap and a scrub-brush, after which the parts are bathed with a solution which has been abstractly named "bichlorid evaporating solution," and which consists of 80 parts of a 3 per cent. boric acid solution made with distilled water, 10 parts of alcohol, and 10 parts of glycerin, which constitutes the evaporating solution proper. Eight drops of a saturated solution of bichlorid of mercury is added to each pint of this solution. It may be interesting to note that the saturated solution of bichlorid is made by using 2 ounces of hydg. bichlor. and 2 ounces of alcohol, to which is added 6 ounces of glycerin. Made in this proportion the bichlorid is practically all dissolved, and 8 drops of this solution to a pint of water equals 1/3500. Thus it will be seen, by adding this amount to the so-called evaporating solution, that it is converted into a bichlorid evaporating solution which has a standard strength of 1/3500.

After this, sterilized gauze is saturated in this solution and, after having applied a sufficient quantity of it—say four or five layers of ordinary gauze—the wound is bandaged in such a way as to expose a portion of the gauze. This solution is prescribed and the patient told to drop a small quantity of it on the gauze which is thus exposed, so that it will keep the entire gauze-dressing moistened; the patient is advised to report every other day. At each subsequent dressing this is removed, the wound cleansed with nothing but bichlorid evaporating solution, and another dressing of the same kind applied.

As a rule, ordinary injuries of the fingers repair in a very short time, and it is the exception to the rule where pus or even inflammation follows these injuries when dressed after this method. If the bichlorid is found to produce a toxic effect, either being absorbed or setting up dermatitis, it is frequently changed for a 10 per cent. solution of creolin in sterilized water, which is a very satisfactory dressing with the exception of the ungrateful odor which accompanies it. Where the skin is dry and hard, and the bichlorid evaporating solution or creolin does not give satisfactory results, glycolin mixture is used. This consists of carbolic acid and oil of gaultheria, each 16 drops; menthol crystals, 16 grains; glycolin, 4 ounces. This should make a clear oleaginous solution, and in cases where there is no pus and granulation is taking place, but the integument about the wound is dry and hard, it makes a most grateful and satisfactory dressing.

This is especially indicated where the nails have been torn off and where the wound has been treated with bichlorid evaporating solution until the new nail has commenced to repair, and where the evaporating solution is not indicated, on account of its irritating properties. In such cases the glycolin mixture is frequently used with very satisfactory results. I recall a series of injuries where I had under treatment at one time, twelve patients with the finger nails torn off, each one being treated by this method without a drop of pus in any case, and all treated in my office in the manner I have just described. In looking up my records, I find that the average length of time in which these parties were disabled varied from eighteen to twenty-five days. In this connection I might say that in each and every instance these were miners, and in following their occupation they were obliged to use the pick and shovel, and hence could not return to work until their wounds were fully repaired.

In the dressing of injuries of this class, and especially for those of us who live on the frontier or in the heart of the Rocky Mountains, it is not always convenient to drop into a first-class drug store and obtain ready-made dressings, and I have often thought it was a godsend that we could not, for it compels us to devise original methods and means for doing our own sterlizing, and preparing our own dressings which, after all, are the safest and best as well as the least expensive. Gauze is purchased by the quantity, of such grade and quality as desired. This is sterilized under steam pressure, which can easily be obtained by any modern portable sterilizer. It is then packed in self-sealing fruit-jars. A large quantity of this can be prepared at one time and, after being sealed with cotton, it can be doubly sealed by "self-sealing tops" and is ready for use at all times. These jars can be packed into portable surgical cases and carried to any point desired. Absorbent cotton treated in a similar manner is always ready for use for dressings. The solutions above can easily be made in an office or an ordinary drug store, and kept ready for use at any time. These can, likewise, be packed into a portable surgical satchel, and I consider them much preferable to preparations which are made in the tablet form, as they are almost instantly absorbed by water, while tablets oftentimes require some considerable time to dissolve, besides leaving a sediment, and we never know whether their strength is standard or not.

It will be observed that I do not pretend to treat accidental wounds aseptically, as experience has convinced me that this plan of treatment is not applicable to dressing wounds such as usually occur in emergencies, and in my judgment is only advisable in such cases as can be thoroughly prepared before an operation is had.

Thus far I have not considered wounds that can be sutured and closed up, but have devoted my time entirely to wounds which were of a contused and lacerated character, which can not be sutured. I will now consider those minor injuries which can be sutured and which, under favorable circumstances, we expect to repair by first intention. To insure healing by first intention, surgical cleanliness and perfect coaptation are essential. In emergency surgery cleanliness is not always so easily obtained, on account of the condition and circumstances surrounding the patient when he is injured. Coal-miners, for example, are covered with grease, coal dust and other filth, similar to railroad employees who, when injured, are often dragged along the ground in such a manner as to fill the wound with cinders and dirt of all descriptions. In bad wrecks I have seen the entire clothing and every wound on the person literally filled with pulverized wood which had been crushed in the terrible force accompanying the accident.

It is no small task to cleanse the wound of these foreign substances, but if we do not take care to remove them at our first permanent dressing, we will meet with more or less trouble and additional work later on, saying nothing of the increased loss of time on the part of the injured patient. To remove this dirt it is often necessary to place the patient under an anesthetic, and to use an ordinary scrub-brush to cleanse the parts, such as is used for the hands, in addition to using the fingers, which are the best probes we have at our command for detecting and removing foreign substances from a lacerated or incised wound. After having thoroughly scrubbed the parts with tincture of green soap, they are then flushed with a bichlorid solution of 1/3000. In many of these wounds, after surgical cleanliness has been secured, their margins are found to be ragged—the fibers of the connective tissue having been brought to the surface—which as a rule are devitalized and, if allowed to remain, will only become necrotic tissue and form a nidus for pus infection. This should be removed at the risk of producing slight hemorrhage, which can easily be stopped by the application of a gauze sponge dipped in hot water. The nearer we come to converting a lacerated into an incised wound, the better the condition for rapid repair.

Having thoroughly cleansed not only the wound but the parts adjacent to it, and having shaved the hair off, if such be present, the edges of the wound are then carefully adjusted and either sutured with sterilized pyoktanin catgut or sterilized silk. The latter is preferable, as it can easily be kept in alcohol, or if not, immersed in absolute alcohol before use, and we have found that it is an exception if a stitch abscess follows the suturing of lacerated or contused wounds when they are dressed after this method. Having carefully approximated the edges of the wound, it is covered with collodion and the patient told to report in two or three days. If the wound is looking well at the first visit, and there is no indication of inflammation or suppuration, the patient is told to return at the end of the week, when, as a rule, the wound is found completely repaired, the stitches are removed and the patient is allowed to return to his avocation.

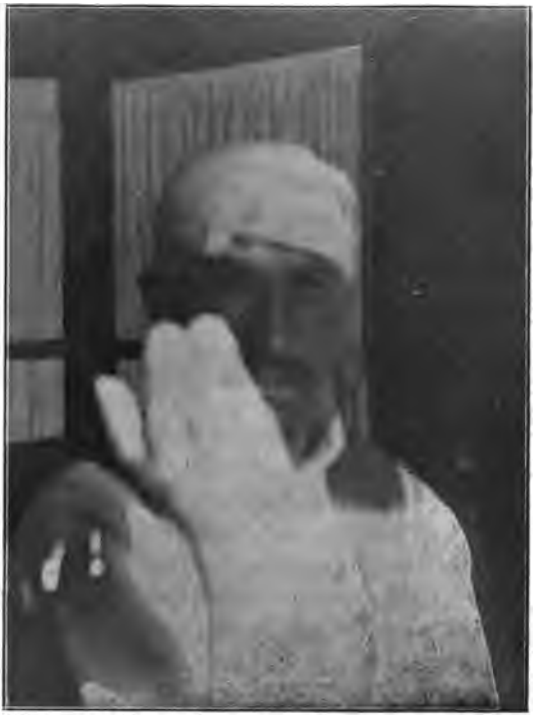

FIG. 1.—Appearance at first dressing.

This dressing is particularly applicable to the head and face, where a bandage is kept on with difficulty, and if it *can* be kept in place it becomes exceedingly dirty in a short time and is often a source of infection rather than a protection. If the wound is thoroughly cleansed and all devitalized tissue removed and good coaptation secured repair by first intention should be the reward of our care and trouble. But if the wound is allowed to become infected before it is sealed with collodion, then suppuration can be expected, and when the collodion is removed, the wound will be found gaping as a result.

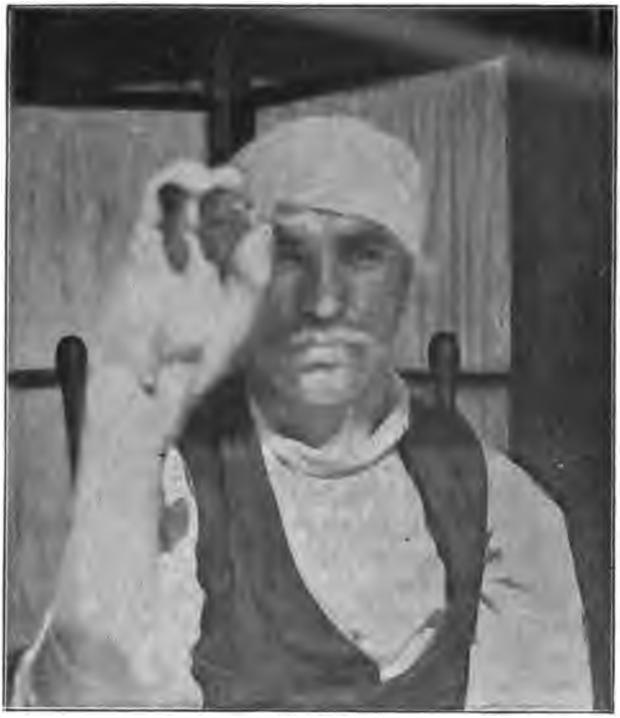

FIG. 2.—Appearance just before skin grafting.

It is sometimes advised to use a thin film of cotton, which is saturated with collodion and placed over the wound. But as a rule I prefer to omit this, as it is apt to become soiled, while a wound sealed with the collodion only can be readily washed and the dirt removed without injury to the dressing.

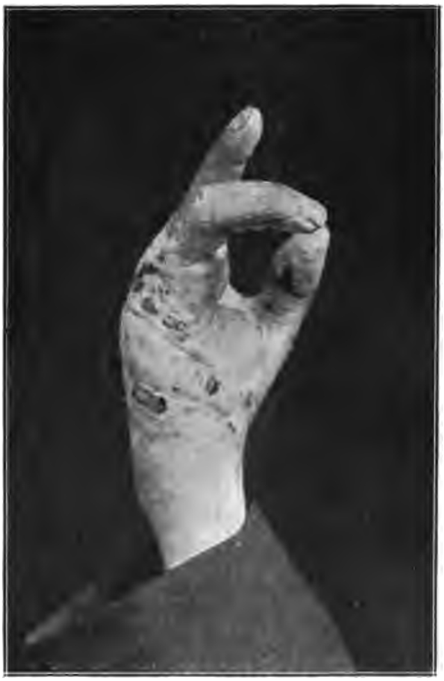

FIG. 3.—Appearance when discharged.

To illustrate the practical results of the antiseptic methods above described for the care of minor injuries, I wish to call attention to the accompanying photographs, showing the condition of a patient's hand, which was injured by his falling off a train. The ring and little fingers, including their metacarpal bones, being crushed by a car wheel, it was necessary to remove them, but owing to the fact that nearly all of the dorsal and palmar surface of the hand was denuded of all integument, we were at a loss to get sufficient flap that was not devitalized, to cover the exposed parts. In cases of this kind I have made it a rule to use all the integument possible, even if I were aware at the time that it was devitalized. It makes the best covering that can be had for a denuded surface composed of fascia and connective tissue. It is necessary, however, to see that the devitalized integument is thoroughly cleansed, in order to prevent the vitalized portions from becoming infected. In other words, it is really a sort of skin grafting, and in some instances integument is found which seems to be devitalized, but it sometimes will become vitalized, aiding very much in the repair of the parts. Where it does not retain its vitality it is easily detected and removed, when, as a rule, we find the surface in a healthy condition with normal granulations which, later on, can be skin-grafted with entire success.

In the case referred to by the photographs, this method was adopted, not more than one-third of the integument that was used to cover the denuded surface retaining its vitality, and the balance had to be removed, leaving a large granular surface extending over the entire dorsal and palmar surface and a portion of the fingers. Notwithstanding that the hand was as dirty as grease, coal dust and cinders could possibly make it, repair took place without a particle of suppuration and, in less than three weeks from the time the injury occurred, the parts had granulated sufficiently to warrant us to make a skin graft. This was done by removing a piece of skin from the arm, six inches in length and one inch in width, and which involved the entire integument down to the subcutaneous fat. As much of the latter as adhered to the graft was carefully removed by a pair of scissors, curved on the flat, when the graft was placed as near the granulating surface as possible, and one end sutured to the ulnar side of the dorsal surface and the other to the ulnar side of the palmar surface. The graft thus passed over the back of the hand, in front of the thumb, below the forefinger and over the palm of the hand. Two sutures were placed in each end of this graft, and one on each side near the center, to keep it spread over the granulating surface as near as possible. Before placing the graft in position, it was carefully washed with a normal salt solution at the temperature of the body, and after being placed in position, dressings dipped in this solution were used next to the granulating surface and the graft and the entire hand carefully dressed with a thick pad of sterilized gauze and cotton. This was not disturbed for three days, when the dressings were removed, and it was found that the entire graft had become adherent and that the hand was in a perfectly healthy condition. This was dressed every day or every other day, and in from six to seven weeks after the injury repair had taken place completely, as is shown by the last photograph. This patient has complete use of the thumb, forefinger and second finger, and will soon be able to resume his work in the mine.

In regard to skin grafting, experience has taught me to take the entire integument, as in this case, in preference to scraping off the epithelium or even making a Thiersch graft, which in reality splits the skin and only takes a portion of it instead of the entire thickness. If the parts are healthy and the graft is carefully removed and sutured in place, there is no more trouble in having a large portion of the skin taken off in this way, adhere, than it is a small portion. I recall a case of this kind in which the entire back portion of the leg was denuded of skin by being burned. I removed one graft from the arm, that was seven inches in length and from an inch to an inch and a half in width, and sutured it on just below the buttocks. Another, six inches in length, was placed three inches lower down, and a third one, five inches in length—all the same width—was sutured three inches below that, all of which adhered without a particle of trouble, and in a short time the entire back portion of the leg was covered with integument and the patient was discharged, recovered.

The importance of using the entire thickness of the integument in making skin grafts is, I think, manifest. The capillaries are better preserved, and, with so much of the fascia as may adhere, and which is known to repair more readily than any other part of the economy, unite with the granulating surface more readily and with less trouble than where the skin is split in two and simply laid on the granulating surface and held there by pressure. When the entire integument is used, it is easily sutured and held in place, and the necessity for pressure is much less and the less pressure used in skin grafting the better, for pressure interferes with circulation and interrupted circulation interferes with union, which is avoided by the use of sutures.

In this brief consideration of minor injuries, we have endeavored to give, in a concise and comprehensive manner, the practical method adopted for years past with a view of getting the most rapid repair with the least possible infection at a minimum expense, and in our endeavors to accomplish this end it seems to the writer that the successful treatment of this class of traumatisms may be summed up as follows: 1. Strict observance of surgical cleanliness. 2. Preservation of normal blood-supply. 3. Perfect coaptation when possible. 4. Simplicity and efficiency of dressings. 5. The use of chemicals which will destroy infective germs but at the same time will not irritate or disturb cell reproduction.

DISCUSSION.

Dr. H. Reineking, Sheboygan, Wis.—Dr. Reed speaks of implanting the skin flaps on the granulations. This is the first time I have heard that advocated. I have had some personal thought it necessary to carefully remove the granulations. Of experience with the implantation of skin flaps, but I have course, that is not done when we use the Thiersch grafts. It seems to me as though it is hardly physiologic, if I may so express it, to put the entire thickness of the skin on a granulating surface. Our teaching has been to remove the grafts, and I would like to hear from the Fellows as to whether they have had any experience in placing skin flaps on a granulating surface, and, if so, what success they have had in so doing. If it can be successfully done, I have no doubt it would simplify matters. By scraping away the granulations we produce hemorrhage, and the operation is prolonged beyond what it would be if the granulations were left. I should hardly think a skin flap, put on a granulating surface, would get sufficient nutrition.

Dr. E. W. Lee, Omaha, Neb.—It is necessary for us, in these operations, to consider the condition of the granulating surface. If the granulations had become somewhat exuberant and were very prolific, when the skin flap was put on, there would undoubtedly be failure. If I remember rightly, Dr. Reed says: "As soon as granulations permit." I believe he means by that, as soon as healthy granulation is established, and not to wait until the granulations become exuberant or until they manifest any tendency to suppuration. I have never used skin flaps over a granulating surface; I have used the Thiersch flaps, and small squares of the integument over granulations, which united very readily without any trouble.

Dr. A. I. Bouffleur, Chicago—The subject of Dr. Reed's paper is very instructive because there is no class of injuries more interesting to railway surgeons. I am very much surprised however, at the large statistics the Doctor gives, as to the number of patients he has treated. One's experience, based on such a large number of cases, is of great value. I was interested in the composition of the bichlorid evaporating lotion, because my own experience with bichlorid under confinement is that it is a decided irritant. Perhaps I am a little sensitive in this regard because bichlorid and I are not friendly, as far as any skin is concerned, and I certainly would not want it placed on my hand in any strength, underneath any protective material, because I know it would give me a severe dermatitis. Bichlorid is a valuable remedy; it is a positive antiseptic, and it should be used as such and not as a constant dressing. That is the general consensus of opinion to-day, because plain sterile gauze at the present time has entirely superseded the use of bichlorid gauze, bichlorid gauze being formerly used with that idea in view.

Dr. Reed's remarks as to the disinfection and maintenance of asepticity are good, and it does not matter very much what method one uses to continue that condition of asepticity. Some of us are good disinfectors mechanically; others require strong germicidal agents to enable them to disinfect surfaces thoroughly, while still others disinfect with a combination of the mechanical and weak antiseptic solutions, like alcohol, lysol, and agents of that sort.

With reference to skin grafting, it is a well-recognized method of hastening wound covering. I have been in the habit of using the Thiersch grafts very largely, and have at times been disappointed in the conduct of wounds so closed. I had always supposed that if we removed the granulations and the layer of connective tissue immediately beneath them, we would not have contraction of surface. I have had experience in closing large defects in the side of the neck in which a grafted surface, two inches wide, in the course of three or four weeks, would be shrivelled up to half an inch in width. One needs to be very careful in using grafts over bony surfaces where there is much pressure, or where there is likely to be friction. Therefore, the suggestion of Dr. Reed in urging the full thickness of the skin is timely, about the palmar surfaces of the hand in particular. I have used skin flaps on granulations when the granulations were to my mind positively aseptic. I have frequently clipped off granulations with scissors, that is, part of them, not removing all of them, however, and have had the grafts adhere. This is a matter entirely dependent on the asepticity of the surface. If the surface is strictly aseptic, the granulations need not be removed. If it is not aseptic, it is absolutely essential that the granulating surface be removed down to aseptic tissue.

Dr. William U. Cole, Columbus, Ohio—With reference to skin grafting, I very well remember seeing Dr. Reed take long strips of skin and get adhesions. I have had the same results as have been referred to in attempting to place thin strips of epidermis on granulation tissue. It is not so much the thickness of the skin as it is that the condition of the wound is such that it will readily take the grafts and the wound must be thoroughly aseptic. It is not very easy to put a skin graft on a septic surface and have it take or adhere, particularly if there is a tubercular condition, or a condition of lowered vitality. A Thiersch graft, applied to a wound, if the parts are aseptic, will unite.

With regard to the treatment of minor injuries in which sepsis predominates, the parts may be kept irrigated in this way: As soon as a man sustains an injury, he should immediately stop work, and a surgeon be sent for, no matter whether it be a minor or a major injury. I am connected with roads where that is the rule, and there is very little pus encountered under these circumstances. The grease that gets into the wound is generally crude petroleum, and I am satisfied of its antiseptic value. However, I may be mistaken in this. I do not remove the crude petroleum from the wound, because in ordinary lacerated wounds I am convinced of its antiseptic value, and I do not recall a case in which pus followed where the crude petroleum covered the skin.

In regard to the suppurative cases referred to, the best way to get rid of the pus is by submersion and the application of iodid of mercury. I would keep the hand or foot constantly submerged for four or five days or more, if necessary. I recently treated a case in which I deemed it necessary to keep the man's foot submerged for sixteen days, believing that he would have lost the foot if this was not done. A bath-tub can be used and a solution made to suit one's inclinations. My favorite solution is boric acid with a large amount of water. In the case of a bruised foot or hand, it is my practice to take the ordinary foot bath-tub, if there is nothing better at hand, fill it with water, and keep the water at a temperature of 100 F. I do not find it necessary to discontinue this except as the patient begins to convalesce, or the wound shows signs of recovery. This method of submersion is worthy of trial, because it attains several objects, and among them the power of absorbing bacteria and ptomains. It has the power of supplying the necessary heat to the injured part; it has the power

of absorbing the material which is natural food for the system. I have seen no bad results following submersion of limbs for ten days or two weeks. I am satisfied that I have saved limbs by adopting this method that otherwise would have been **lost.**

SUGGESTIONS ON RIGHTS AND LIABILITIES OF SURGEONS.

BY T. J. MAHONEY.
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The lawyer is nothing if he is not generous. He is willing to help you out of your difficulties—for a retainer. If, so be it, he can not get a retainer, he will tell you how to keep out of difficulties, for glory; and if there is neither retainer nor glory in sight, he will do it out of pure force of habit.

It is doubtless true that the surgeon is more often compelled to face a situation in which he must consider his own rights and liabilities than is the general medical practitioner. He is often called on to make an election between taking desperate chances and doing nothing. He is called to treat a man who has met with a serious accident. The patient is unconscious. An operation of an important and serious character, involving elements of danger, seems to be necessary. The man is in a critical condition, and if the operation is to be performed at all, it must be without loss of time. The patient is not in a condition to give his consent to the operation. What shall the surgeon do in such a case? What are his rights, and what are his liabilities? Will he be charged with neglect if he refuses to act, or will he be held liable for malpractice if he takes off a limb or opens the abdomen without the patient's consent?

Surrounding circumstances will often assist in resolving these doubts. If the injured man is at his home or surrounded by members of his family, the law will constitute his family his agents to consent for him, that the operation may proceed, and such consent will protect the surgeon to the same extent as if it were given by the patient himself, in the full possession of his mental faculties. But the injured man may be a guest at a hotel or a passenger on a railroad train. He is not in a condition to speak for himself, and there is no one present with either express or implied authority to represent him. Neither is it practicable to communicate with his relatives with any hope of receiving a response in time to be available. In such a case the difficulties of the situation are quite serious. If an important operation is attempted and it should turn out badly; if a limb is removed and the patient, on recovering, can make it appear that the surgeon's judgment was erroneous, even though honestly exercised and with average skill and care, the surgeon is liable and may be compelled to respond in damages, as for malpractice.

The rule as to consent may be briefly stated thus: Where the operation is consented to either by the patient or by those authorized to speak for him, the surgeon is not bound to an unerring judgment; he is protected, if, in his diagnosis, in obtaining consent, and in the operation itself, he exercises average professional knowledge, skill and care. But where he has no consent to operate, he will be bound to the exercise of an absolutely correct and unerring judgment, and he takes on himself the risk that it may afterward be established, even by the aid of facts not known to or discoverable by the surgeon at the time, that the patient would have been better off had the operation been omitted, and that damages may be recovered where no want of skill or care is shown. Cases may no doubt arise in which the desire to save human life—an impulse of humanity—coupled with such certainty that the operation is necessary, will justify proceeding without the patient's consent. But in every such case, the surgeon, by proceeding without consent, takes the risk of any evidence that may be afterward discovered tending to show that the patient was, in fact, damaged by the operation

On the other hand, where the consent is obtainable, either from the patient himself, or from those who have a right to speak for him, a surgeon would be liable for malpractice for failing to operate where the exercise of average professional knowledge and skill would disclose the necessity for an operation; but where consent is not obtainable—where all the risks of an operation are thrown on the surgeon—he will never be held guilty of malpractice for failing to operate.

Consent may be implied as well as expressed. If a conscious patient puts himself in the charge of a surgeon, and afterward becomes unconscious, he has by that act given implied consent that the surgeon shall take such course as his best judgment suggests, and he has, in like manner, imposed on the surgeon the obligation of operating if average professional knowledge and skill would indicate that an operation ought to be performed; or if a person, conscious of having received an injury, sends for a surgeon and becomes unconscious before the surgeon arrives, he has thereby given his consent to whatever course of treatment may be reasonably necessary or proper, and has imposed on the surgeon the obligation of so proceeding.

In considering rights and liabilities of surgeons, we are now dealing with legal and not ethical questions. I have no doubt that the surgeon's own code of ethics is sufficient guide in determining the propriety, from a professional standpoint, of making any disclosure respecting information intrusted to him by his patient. But because of the necessary uncertainty of all ethical codes, they are not safe standards in determining legal responsibilities. The law deals with two classes of disclosures; those given on the witness-stand, and those given out of court. As to the former, the surgeon will not experience much difficulty, because the court will in each instance determine whether the information should be disclosed or not. Still, the rules applied by the courts in deciding what matters the surgeon may disclose on the witness-stand afford the only safe way in which to determine what disclosures may be made out of court. These rules may be thus briefly summarized:

1. The relation of physician and patient must be established or there is no restriction in the making of disclosures.

2. The information must come to the physician or surgeon in his professional capacity.

3. The information, to be privileged, must be such as is imparted to enable the physician or surgeon to perform his duties in the usual course of practice.

4. It will include all information imparted, whether orally by the patient, the statements of nurses and attendants, and the facts learned by a physical diagnosis.

5. Even facts not bearing on the ailment for which the treatment is given, but learned incidentally in the course

of treatment or diagnosis, are privileged, and may not be disclosed.

It is impossible to fully elaborate or illustrate these rules here, but a few explanations may be given. The payment, or even promise, of compensation is not necessary to establish the confidential relation. A charity patient is entitled to the same protection as the best paying one. Neither does it matter whether the employment is by the patient or by some stranger, as by a carrier of passengers, as in case of wrecks and other accidents, or by the public, as in the case of paupers. In all such cases, whether the physician or surgeon assumes to treat the patient, or to examine him with a view to deciding whether he shall be treated at all, the relation is established and the obligation of secrecy is imposed. It is not every communication that is privileged. A patient may voluntarily make many disclosures, to his physician, that have no relation to the professional duties of the latter. He may talk about his family or business affairs; but communications of this character are not imparted to the surgeon in his professional capacity and are therefore not privileged. Neither is it true that every communication imparted for the purpose of obtaining treatment is privileged. It must be such as is imparted to enable the surgeon to perform his duties in the usual course of practice. The usual course of practice does not include conspiracies to defraud. Thus, one man may subject himself to treatment for the honest purpose of remedy, and the information imparted by him will be privileged, while another man may inform his physician that he has a certain ailment for which he desires such treatment as will mask the ailment and thereby enable him to perpetuate a fraud on a life insurance company.

Such a communication is not privileged, because it is not made for treatment in the usual course of practice.

There is some conflict as to whether confidential communications include anything more than the mere statements of the patient, but the greater weight of authority, as well as the better reasoning, is in harmony with the rule just stated. A more serious difficulty arises in regard to facts incidentally learned. A very strong case in point is that of a woman who brought suit on account of an injury claimed to have caused an umbilical hernia. The defendant sought to prove, by a physician who had attended the patient in childbirth, previous to the accident, that at that time he observed the hernia and it could not, therefore, have been caused by the accident; but the court held that even though the physician had not treated the woman for the hernia, and learned of its existence only incidentally, still it was information which came to him in his professional capacity, and in enabling him to perform his duty in the usual course of practice, and he was therefore not permitted to disclose it.

These suggestions on confidential communications should be qualified by the remark that the privilege did not exist at common law, that where it does now exist it is by virtue of statute, and as statutes as well as their interpretations differ in different jurisdictions, the rules here given can not be regarded as of universal application. They do, however, fairly present the law as most generally enforced in this country. It may be added, also, that no matter how good the motive of the physician or surgeon may be in disclosing confidential communications of his patient, the motive will not protect him. This was well illustrated in the comparatively recent case of a London physician, who, desiring to prevent his wife and daughter associating with a certain woman, disclosed to his wife confidential communications received from his patient. As disclosing the secret to his wife was equivalent to disclosing it to her friends, the physician afterward had the satisfaction of paying a judgment of £12,000, and the costs of the suit.

An enterprising Omaha newspaper recently published a symposium of letters from a number of physicians in answer to the inquiry "whether the doctor is ever justified in refusing to prolong the life of a patient mortally ill." Most of the physicians took the postition that in no case should the physician permit the patient to die while it is possible to prolong life. But a few did not fully agree with that doctrine, and one, who discreetly concealed his name, said that in cases of mortal illness, the means of committing suicide might be placed in the patient's reach, and if he is intelligent he will use them promptly. I shall not discuss this subject from a scientific, ethical, or theological standpoint. The rule of law is very simple, and in exact harmony with the commandment: "Thou shall not kill." The statutes defining murder and manslaughter make no distinction between killing a sick man and a well man. Neither do they recognize as legal, in this country, a practice said to prevail among certain tribes of Patagonians who have not sufficient intelligence to stand on the shady side of a tree, by virtue of which those who have grown so old as to be unable to help themselves or others, and who are certain to die soon in any event, are boiled into soup for the nourishment of the rising generation. Permit me to say, in closing, that I am not an advocate of "Jacks of all trades," and that when the surgeon is really in need of a legal opinion, the best advice I can give him is to hire a lawyer.

RELATION OF RAILWAY SURGEONS AND CLAIM AGENTS TO EACH OTHER.

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From the inception of the steam engine to the vast network of iron rails that crosses and recrosses the country, bringing about ever-changing conditions and ever-increasing demands; from the early time, when all the ills to which the flesh is heir were combated but by the most primitive methods—and only to the inherent ruggedness of man is due the fact that any of him survived the onslaughts of disease—to the wonderful achievements of medical science in these latter days, when about all the physician and surgeon can not do is to restore the breath to the lifeless body, are far steps. I will be frank and add that still farther is the one, and still more marvelous the mental gymnastics, which will, I fear, be found necessary to trace out the subtle—very subtle—connection between some of the various ramifications of this paper and the topic indicated on the program for discussion, and if, consciously or unconsciously, I have digressed from the text, I invoke your pardon. In following out the line of thought that has suggested itself to me, I find it necessary to go back and briefly sketch the growth of the conditions which have given rise to those two important, and I may almost say typical, representatives of this age of progress and organization—the railway surgeon and the claim agent.

The period from the last quarter of the eighteenth century, when the transportation question first began to demand and receive attention, to the closing years of the nineteenth, has witnessed changes of an almost revolutionary character in methods of conveyance. Up to the beginning of that time the problem of land carriage had made but little, if any, movement toward solution since the dawn of history; while it is practically during the last fifty years that all real advancement has been made, bringing railroad travel to the front and rendering it the most common and important of all travel. The many thousands of miles of railroad which have been built and maintained in that period have made possible such social, commercial and industrial changes as even the most advanced theorists of the early days of the Republic would have hestitated to predict. It is by this means that the broad empire of the West has been built up, until our country stands first among the nations of the world in wealth and progress, if not in commerce.

The average man, however, whose attention has never been particularly directed to the matter, is prone to simply observe the results, without taking into account the controlling force which governs—the hand at the throttle—and in so doing loses sight of the most interesting as well as the most material part of the whole. The visible growth of the railway is no more amazing than the internal development of the medium which has made such growth possible.

In the crude state of the railroad system one head was sufficient to superintend and safeguard the interests of the whole. Naturally, the workings of the various departments of a twelve-mile railway—the length of the first American line—were not especially complicated and did not require an overwhelming amount of thought and energy. But when we consider that railroad mileage in the United States alone has grown from twelve to a quarter million miles, that the first score of employees have become nearly a million, that a few hundreds of dollars in railway capital has increased to twelve billions, or about one-sixth the entire wealth of the nation, then we begin to realize the stupendous amount of brain energy that has been crystallized into the form which has tended, more than any other single factor, to make man

This is essentially an age of specialization and organization, and nowhere is this idea more fully carried into effect than in the management of a great, modern railway system. The highest possible degree of efficiency, including safety, reasonable charges and prompt and adequate service, is the demand in the conduct of these immense interests. This end is only attainable by a division of the work into departments, each having at its head an officer selected, theoretically at least, with reference to his special fitness for and knowledge of the particular branch under his immediate supervision. The legal, traffic, operating, accounting and road departments, with their various subdivisions, have their individual fields, which touch, without overlapping, the boundaries of the others.

It follows as a necessary sequence of these new conditions, that new complications are constantly arising and new problems claiming solution, necessitating new ways of reaching and coping with them. One of these conditions is brought about by the more or less calamitous interference of various foolhardy or unfortunate individuals with "the operation and management of trains," resulting in personal injuries; and there is where the railroad surgeon and claim agent step on the scene and find a wide field for the display of their genius —or otherwise.

One of the more serious questions which to-day confronts those who have the whole or part of their capital invested in railroads is the undeniable antagonism of the general public to railroad corporations, and the prevalent idea that it is perfectly proper and laudable to overreach the railway company on every possible occasion. As a result, the money yearly paid out voluntarily, and involuntarily, in the adjustment of claims against a railroad, constitutes a heavy drain on its treasury. The principle—if there be any principle about it—generally adopted, seems to be that the railroad is the legitimate prey of all who can get within fighting distance. Legislatures enact stringent laws against it, courts by adroit construction establish grounds of legal liability which the lawmakers have overlooked, and, if perchance the company should escape unscathed from this double fire, it is almost certain to fall before the relentless assault of a jury, whose motto is, evidently: "When in doubt, mulct the corporation." They pray fervently for the building of railroads and ever thereafter prey on them.

It is just possible, not to say probable, that the railroads themselves have been instrumental to some extent in bringing about such a state of affairs. In the early days, before railroad traffic assumed such proportions, accidents were of far less frequent occurrence than at the present time, and it may have been considered by the companies cheaper to litigate even meritorous claims than to pay them, hoping thereby to discourage future similar charges, and that the expense of going to law would deter the prospective claimant from seeking a remedy in the courts. As events have proved, this was a disastrous policy. The American people, ever desirous of fair play—when it does not militate against their personal interests—seemingly determined to and did get even whenever in the capacity of jurors it was given them to sit in judgment on the company. Gradually it became clear that the interests of all parties concerned would be best subserved by settling all such matters out of court, when practicable and expedient. To this end the claim department was organized, though even before then the railway surgeon was looked upon as an important part of the road's equipment, though his earlier duties were usually confined to attending injured employees.

To decide when a settlement is practicable and expedient is one of the most difficult tasks of the claim agent, and one which calls into exercise his utmost tact and discretion. Upon him devolves the duty of making a thorough investigation of all injuries which may be traced, however remotely, to a possible neglect or oversight on the part of the company. It is for him to allay the suspicion that the railroad will evade by every possible means, fair or unfair, the payment of any claim, no matter how just or well founded; to recognize that much of the prejudice against railroads has arisen from the delay of long litigated claims; and to demonstrate to the public that, while the corporation may be "soulless," it has at least a rudimentary conscience—for the public mind must be educated by degrees to grasp the idea of a body corporate with humane attributes.

Closely allied to the claim agent, in general purpose, though differing in special function, is the railway surgeon. Each has for his ultimate aim the establishment of truth and the alleviation of distress. Each has, in a measure, to fight battles with the same hostile forces. The surgeon confronts and contends with empiricism in his profession and simulation in the patients. The claim agent, in addition, has to combat the prevailing sentiment that "all's fair in war" against a corporation.

There is, however, another and less gloomy side of the work. There are honest claimants with just grievances, who are willing to listen to reason, and the majority of medical practitioners have not, in their strife for success, made so paramount the accumulation of the almighty dollar as to have lost sight of the lofty aims and exalted motives which should animate those who are the acknowledged benefactors of the human race. Notwithstanding the contest which is ever being waged between science and quackery, between justice and cupidity, the truth is constantly gaining ground, and in the end will surely triumph over dishonesty, ignorance and wrong.

The developments in medical and surgical science have steadily gone on from century to century, and the one now closing has witnessed such progress as may well make us feel that even yet there may be "such things in heaven and earth as are not dreamed of in our philosophy." The fundamental principles, however, were laid at a period long antedating the present era, and it may be well for us to remember that, as with all other developments of the human intellect, present attainments in the art of healing have been founded on those of the past, each generation furnishing a plane upon which the next succeeding has stood and raised itself to still greater heights.

Contrast the condition of the victim of disease or casualty of to-day, with that of the sufferer of a comparatively few years ago. Speculation as to the nature of and remedy for his malady has given way to scientific exactitude. Conditions which once were deemed certain to produce death, and the unfortunate patient given up as a hopeless case, have been so successfully studied and analyzed that rare, indeed, is the physician or surgeon who dares to say positively that a man has absolutely no chance of life; while the success of the members of the profession in staying the vital spark in the disease-stricken or mangled body is an ever-recurring wonder. Indeed, some intelligent, profound men, among them Judge Baldwin of the Connecticut Supreme Court, have gone so far as to say that in certain cases the physician is unwarranted in prolonging life as long as he does, at whatever cost of discomfort or pain to the sufferer, and suspense and exhaustion to his family. Judge Baldwin says in part: "There are certain maladies that attack the human frame, which are necessarily fatal, and others which naturally end in a speedy death, but may be so treated as to lead to a protracted state of weakness and suffering, incompatible with any enjoyment of life or useful activity, and from which there can be no reasonable hope of recovery." Then he adds: "Is not this a misapplication of the healing art? I say it is not right that such a life should be prolonged in hopeless misery by medical art, when nature has plainly called the sufferer away."

Such radical and plainspoken views are startling, even to our nineteenth century minds, which might almost be thought to be thoroughly inoculated against startling things. But whether we agree or not, we can not but confess that the ideas thus advocated are a remarkable tribute to the recognized power of the medical profession. It is rather an unusual complaint that the physician or surgeon causes his patient to live too long, and one that, if generally established, would force the so-called humorous papers to alter their stock of time-honored jokes along this much-enduring profession, to something more in harmony with the trend of modern thought.

One of the many praiseworthy traits of the surgeon, which has helped to attain his present high position, is his perseverance and his investigating trend of mind. He is not easily discouraged. If his skill is baffled at the first point of attack he is ready to try again on some other tack. Like the physician of the late lamented Bill Nye, if he doesn't know what is the matter he is willing to keep on trying until he finds out: and any patient who is inconsiderate and unfortunate enough to succumb to the effects of some unusually interesting and novel operation or experiment must find ample satisfaction, as he wanders on the Stygian shores, in the thought that he fell as a martyr to scientific investigation.

The discovery and growth of the germ theory has done as much as any other factor, if not more, in revolutionizing medical and surgical methods. No farther back than 1854 was it that Louis Pasteur proved conclusively that micro-organisms, so far from being comparatively unimportant, as had been maintained, were of much greater consequence that had ever been claimed for them; that without them there would be no putrefaction, no fermenation and no decay of tissues, save by the slow process of oxidation.

Among the first-fruits of this discovery was the practical application of these demonstrations to surgical science. Dr. Lister, arguing from the tests of Pasteur, arrived at the conclusion that if the microbe or bacterium attacked dead organic matter, it might with equal reason assail living tissues; then, why not injured surfaces and wounds? Such was the logic upon which Lister based his reasoning, his object being to discover a bactericide which, while perfectly harmless to the patient, might serve to destroy and exclude germs. It is impossible to overestimate the value of the success which finally attended his investigation. To surgeons, above all, the new procedure was of signal importance, since it enabled them to grapple more effectively with conditions which had hitherto defied their utmost skill.

Modern research has elaborated the basic principle demonstrated by Pasteur, to an astonishing degree, and in making an actuality of a theory has added largely to the sum total of the world's wisdom and welfare. Whereas, the invalid of not such a very remote period could only suffer from a few easily classified diseases, in this enlightened age the very poorest man can indulge in ailments whose very names, mysterious and high-sounding as they are, are hidden from all but the initiated, can maintain and cherish a large and flourishing clientele of microbes, and other insidious forms of disease, the very existence of which was unknown to his great-grandfather, and the conscious possession of which was an unthought-of luxury to even the wealthiest and most aristocratic of former generations. In face of these facts, who can forbear to acknowledge the superiority of the present over the past? Should any feel so disposed, we can even go a step farther, and show him that the age has furnished not only the malady, but the cure, that with the evil has also been provided the way of escape; for the physician and surgeon, as he exists to-day, is an up-to-date effect of an up-to-date cause.

Perhaps the greatest of all boons to suffering humanity, however, has been the discovery of the anesthetic properties of ether. This is purely a product of American genius, since, though some slight experiments in that line had been carried on in England, it remained for an American dentist, Dr. Wells, to give the idea a practical application. Subsequent tests proved conclusively that the seemingly impossible, the miraculous, had been accomplished. No longer are such expedients needful as caused the tender-hearted surgeon of some past age, when forced to resort to an amputation, to graduate shock as it were, by excising the diseased member an inch at a time. Now the patient sleeps quietly while the knife is plied, and awakes to astonished comprehension to find the ordeal over.

The consequential results of this discovery are no less important than its direct effects, since with its aid the progress of scientific medicine has been greatly facilitated, by making possible those experimental researches which, without it, would have been forbidden by the dictates of humanity and mercy.

The points on which I have lightly touched are but isolated instances of the wide scope and wonderful revelations of the field of medical science and the explorations which have been made therein. It affords the broadest opportunity for benefaction to the human race, and its explorers have proved themselves worthy of the task they have set for themselves. I am honored to be associated with them in that capacity, and when in the railway service we are brought together the relationship is to me a matter of pride.

The railway surgeon and the claim agent; one the exponent of the humanitarian element of the age; the other, of the utilitarian; both working for the welfare of the unfortunate; both making it their end to aid, encourage and assist. It is the lot of each to meet and mingle with all sorts and conditions of men, the flotsam and the jetsam of humanity, whose only common attribute is their common need.

With the growth of railroads has come an increase in the number of accidents resulting in personal injury and death. To reconcile and adjust the conflicting interests of the parties is the none too simple task of the claim agent, and one where he must call in the experience, advice and skill of the railway surgeon. While on the other hand the former is handicapped by an undeniable distrust for every one connected with the railroad, it is none the less true that as to the latter he enjoys to a special extent the trust and confidence of mankind as a class. He comes to them in their need, in their weakness, and they instinctively turn to him for succor and rely on his wisdom, judgment and fidelity.

If at any time the victim of an accident is likely to entertain a fair and honest view of the whole matter and the question of adjustment, it is directly, or very soon, after the same has occurred, before his mind has been wrought up by the officious sympathy and misplaced zeal of his neighbors and relatives, and before he has become imbued with the idea of making his injury the stepping-stone to a fortune, at the expense of the railroad company. It is then that the surgeon, as the judicious friend and helper, may be largely instrumental in bringing the matter of settlement to a speedy and satisfactory conclusion, advantageous to all parties. Often the patient is injured much less seriously than he fancies, a few slight bruises perhaps augmented by fright and nervousness and alarming proportions. Here is the opportunity for the surgeon to delicately advance the ends of justice, and here he finds his most perplexing task, to tone down a distorted imagination and minister to a diseased mind, as well as treat whatever purely physical ailments may exist. If he is successful in the performance of his duty—and I am only doing him justice when I acknowledge that he usually does all that can reasonably be expected of him—he has not only blazed a way for the claim agent, but has smoothed the path to a gratifying extent.

It is true that in spite of all rational efforts a settlement is not always feasible, and the case has to be fought out in the courts; but this is not because the surgeon and the claim agent have failed to exhaust whatever powers are given them in their particular functions—the cupidity and the litigious disposition of claimant coming under the head of matters over which they have no control.

Under existing circumstances, the railway surgeon and the claim agent can not but feel a peculiar sympathy for each other's trials, tribulations and triumphs. Looking on their duties as a whole, their interdependence is obvious. If it were not for the surgeon, who patches up, repairs and cheers the more or less dismembered or disgruntled victim of an accident—for which, strangely enough, no one is ever in fault—the claim agent's bed of roses would contain even more thorns than it now does; while, on his part, the claim agent makes it his duty to take what is left of the subject of the surgeon's tender ministrations, and convince him that the making-over process which he has undergone has been, all things considered, highly beneficial—a sort of physical regeneration, which has served only to enhance his original value to himself, his friends and the community. I think I will hardly be contradicted if I say that when the claim agent has done this he has proved himself a benefactor to each of the several parties involved in the transaction, and an especially valuable advertising agent to the surgeon. But even his most diplomatic efforts would fail, were it not for the skill of the latter to give at least a foundation on which to base his arguments.

The work of the railway surgeon and claim agent is not of a kind that usually commands public notice. When, if ever, the matter on which they have been engaged reaches publicity, they have dropped out of it. Just as the man who oils the machinery seldom gets more than a passing thought, so they, who act such an important part in the management of the railroad, are almost ignored by the unthinking mind. Even in this respect the claim agent has to yield precedence. It can not be denied that he lacks one advantage enjoyed by his co-worker. While the latter has all the prestige of an ancient and honored profession behind him, the former, as the product solely of latter-day civilization and progress, has had to elevate his work, instead of having it elevate him. He has been obliged to raise his position from its early level, of a necessary evil to the railroad company and a sort of wolf in sheep's clothing in the eyes of the public, to a plane of respectability and credit. But this fact does not affect the honor and admiration he has for his efficient colleague. On the contrary, it increases his pride in the association and the fraternity he is permitted to enjoy. He rejoices at the surgeon's achievements, and they are many, as his own, and no one is readier to exalt his art and render tribute to his skill. He sees that they two fill successive places on the same path, leading to the amelioration of suffering, the establishment of justice and the promotion of the interests of their employer. While to one no more than the other, it is a satisfaction to feel that the world at large is gradually coming to acknowledge this their position and accord them their due meed of credit; and though it keeps them rather constantly in the pillory of public opinion, so often unjust, it will, I am confident, at no very distant day recognize them as two of the most practical philanthropic agencies of the time.

DISCUSSION.

T. J. **Mahoney**, Omaha, Neb.—The discussion of the relation of the claim agent in the matter of accidents for which corporations may or may not be legally liable will depend a great deal on the standpoint from which the picture is viewed. It is not every claim that is made against a corporation that is fictitious. Every suit that is brought on a contingent basis is not without merit. It is not every case where men differ as to legal rights and legal liabilities, that the man who may happen to be wrong, or the corporation that may happen to be wrong, is necessarily without a conscience, because in an honest contention for its own rights it may be mistaken. There is no question that the claim agent, who does his work honestly, who reports all facts to his company truthfully, who in his negotiations with his adversary speaks the truth to his employer, will finally be recognized by all concerned as rendering the best service to his employer, and there can be no mistake that the railway surgeon who, owing to the peculiar nature of his services, where it is proper for him to make disclosures of the condition of a patient, and he does it honestly and truthfully, will render the best service to both participants in any legal controversy that may thereafter arise.

I do not know that more could be said respecting the attitude of those gentlemen to their employers or to the public, than to say that in the end those of them who exemplify and illustrate a deep-rooted sense of integrity, and I believe cnly those who possess such sense can rise to very responsible positions, will be found to be not only the most serviceable to their employers, but that to themselves it will be demonstrated that honesty is the best policy. It does not necessarily follow that a claim agent is, in the mind of the public, as the gentleman who read this paper expressed it, a wolf in sheep's clothing; not by any means. Those who hold responsible positions are enjoying just as good reputations for fair dealing as those who hold responsible positions in other callings. Occasionally a man may bring dishonor upon his fellows in the matter of settling claims, just as occasionally it happens that an unscrupulous lawyer, finding a case brought to him that does not merit bringing suit upon the facts disclosed, may advise the client as to what facts ought to be sworn to in order to make a case. In neither instance do we find a very great measure of success attending practices of that kind.

Dr. W. W. Grant, Denver, Colo.—We all know that there is some sort of public opinion to the effect that railway lawyers and railway surgeons are prejudiced from the beginning in behalf of the corporation and against the patient or the claimant, however honest he may be. This we know is an error. and one about which we ought to enlighten the public and those who advocate the individual rights of these claims.

Dr. T. B. Lacey, Council Bluffs, Iowa.—In his paper Mr. Losey alluded to the fact that the claim agent is usually and almost unexceptionally looked upon with distrust by all with whom he comes in contact in the way of a prospective settlement. It occurs to me that much of that feeling has been, and more of it can be, overcome, and I think it depends almost entirely on the attitude of the claim agent or his representative. There are many ways of accomplishing certain ends, and it depends largely on the method with which the claim agent or his representative approaches the person with whom he desires to procure a settlement. We all know that as we are associated with one another we have certain bearings, certain attitudes, certain methods of expression, and certain tones of voice which frequently beget antagonism. This is certainly a matter which can be cultivated and largely overcome. We have very much the same condition of affairs as regards the railway surgeon, as to the light in which he stands toward the employees of railways, as switchmen, trackmen, trainmen, etc. I do not know how better to explain it than to cite a case in my own experience. A switchman unfortunately caught his hand between the bumpers, and he lost three fingers and about half of the hand. He went to my office, and at that time I was here in this institution (Creighton Medical College) delivering my weekly lecture, and after finding that I was not there, they called in another surgeon, a very competent and good man, but the patient would not submit to any action on the part of that surgeon. He said: "I have come here to have Dr. Lacey treat me. and I can not allow you to touch my hand because it hurts, and I am going to wait until Dr. Lacy comes, if I have to remain here until to-morrow morning." What brought this man to my office? Just a little act on my part. He said he saw a fellow employee injured and I was called to treat him, and all I did was to look at his hand, turn it over in a way that developed this man's sympathy, using great care on my part not to cause any pain or suffering, and this made a profound impression on the man. The physician whom they called in my absence could have done just as well as myself. I believe the claim agent can make the same impression in his line of work if he makes an effort to do so.

As to the remarks of Mr. Losey regarding Judge Baldwin of Connecticut, in reference to whether we shall prolong or in any way shorten the life of a person who is mortally sick or injured, we are placed in a position where we do not know just what we ought to do or what can be done. We know that we do everything possible to prolong a man's life.

Within the last week a laborer on the Northwestern road, working on a sand train, for ballasting a new track, was standing on the platform of a flat-car carrying sand. He was watching a passenger train passing, and while doing so the engine attached to the train of flat-cars on which he was standing started. The jolt threw him between the cars, and the wheels passed over the lower part of the abdomen, crushing the innominate bones, the pubic bone, and badly lacerating the abdomen from side to side over the region of the bladder. There was severe hemorrhage and profound shock. The man was not in a condition to be seen by any one. Any surgeon seeing him would have said he had to die, and he did. I told him that I did not believe he would live, and he said that he wanted something to put him to sleep. I did not look at it as he did, although he said it with great earnestness. I knew that he meant more than he said. He meant that he wanted something to put him to sleep so that he would never wake up again, and told me so. He said he wanted his suffering ended. I told him that while I sympathized with him, I could not deliberately give him enough morphin to kill him, and I would not do it. What can a man do in such cases? Here comes in the question of Judge Baldwin. Where does humanity lie in such a case? That seems to be the paramount question. I would not give this man enough morphin to kill him, although I knew at the same time, that there was no possibility of his living any great length of time. He lived three hours after the injury. This case simply shows what we have to go through and how our sympathies are worked upon.

I wish to cite another case: It was not a railroad man, but a brother physician, 80 years of age, with pneumonia. He had been sick for several weeks. An extensive abscess had formed and he was gradually declining. I went to see him; he was suffering considerably, and we used morphin to relieve him. He was one of those men who, when he looked at you, seemed to look right straight through you. He said to me: "Doctor, I want plenty of morphin powders left on the table to-night, because I want to have a comfortable night." But he spoiled it by saying: "You know that I ought to have been dead three weeks ago." He wanted enough left so that he could take it all in one dose and end his sufferings.

These are abstract questions that are exceedingly difficult to determine, and we probably never decide them. These things nevertheless work on our sympathies and we do feel for patients. In our association with railroad men, by showing them that we have sympathy, we can accomplish more for them, I do not care whether we are doctors or claim agents.

Dr. L. E. Lemen, Denver, Colo.—There is no question but that any of us, who had much experience, have had our feelings seriously tried under these circumstances in determining whether or not, from a humanitarian standpoint to help or to relieve people who are suffering terribly from injuries. But in those cases of railway accidents, attended with profound shock, a great deal of pain, where the trouble is acute and not chronic, there is no question but that it is the duty of the surgeon to prolong life, as long as he can, whether he uses narcotics or morphin. My conscience is not partial on this point at all. I do not care how severe the injury is and how grave it is, if morphin is judiciously administered, it will prolong life and render the sufferings of patients almost *nil*. Take a case like cancer, and it is a different proposition. Where a healthy person has received a serious injury which is beyond question of recovery, I would administer drugs for the relief of pain quicker than I would in a chronic case.

Dr. J. T. Eskridge, Denver, Colo.—There is another relation that needs to be referred to in connection with this subject; that is, in regard to the so-called medical expert, let him be a surgeon, physician, gynecologist, or neurologist. I recall several cases in which claimants were examined by physicians employed by the attorneys on both sides of the case, and yet we came to the same conclusions in examining the patients, the physicians representing both sides giving practically the same testimony. If physicians worked together with the claim agent, or with the agent for the defendant, many of the discrepancies that now exist would be swept away. Men on the witness-stand ought to be honest, absolutely impartial, simply testifying to facts. One mistake the medical man makes on the witness-stand is by being a partisan one way or the other. We should be impartial and unbiased in our testimony, and above all we should insist on having the privilege to confer with medical experts on the opposite side. In two or three cases I have refused to go into court and testify in cases because I was not allowed to confer with the physicians who were to give testimony on the opposite side.

Dr. A. I. Bouffleur, Chicago.—There are one or two points I wish to emphasize, and one is that the relation of the doctor to the company should be on the basis of absolute truth regardless of effects, because there is no one who is so greatly concerned in regard to the truth as the claim agent. It has been said time and again that railway companies expect favors from doctors. I do not believe it. Every general claim agent, or the settling representative of the general claim agent, wants the surgeon to give him the facts and, if in doubt, to make the case a little worse than it really is. In other words, he would like to have the conditions a little overdrawn rather than belittled, because on the surgeon's statement he and the legal department must base the decision of the company. On the witness-stand the doctor is sworn to tell the truth. Unfortunately, truth is an elastic thing sometimes when it comes to one's individual opinion, because no one can question a man's veracity as far as his opinion is concerned, but the truth, be it for or against the company, is what the claim agent wants.

The other point is as to the relationship between the claim agents and the profession. Any claim department does injustice to our profession by asking surgeons to act as settling agents. There is nothing that so degrades the medical profession as to be asked to put a valuation on a man's injury. A railway surgeon has nothing to do with this. The less he pretends to know about settling claims with the injured, the more will his professional opinion be appreciated. I once had a claim agent ask me repeatedly: "Doctor, how much do you think we had better give this man?" I simply replied that he was the best judge of that. I told him he was an expert in that line. I finally told him, in the presence of the injured party, for the sake of stopping such inquiries, that "I did not know whether it was best to give him 10 cents or $10,000." There is only one exception where the doctor can intercede, and that is where the patient or injured party asks him. In such a case the doctor is the agent of the claimant, and not of the company. Every one of you have had that experience; we have had it in the city time and again, where the doctor is acquainted with the injured party's circumstances, so that he can get something out of the company for it.

The point of taking a man's life when he is suffering terribly seems hardly worthy of discussion. Hippocrates settled that question for all time. He said that the function of the physician was to prolong life and to relieve suffering. That is our duty. Above all things, if we can not prolong life, we must try to make our patients comfortable while they are living. It is a crime, when a patient is suffering greatly from malignant disease, to give him a fatal dose of some drug to terminate life as soon as possible. Part of our duty is to relieve suffering. If it were not so, we would not have the larger portion of our present work to do. If you will carefully investigate your cases, you will find that we do very little indeed toward curing people. Nature does that. We simply relieve the patient's suffering in the vast majority of instances, and let Nature do the curing. How many of you have had cases of carcinoma of the uterus, particularly those that appeal strongly to you, and how many of you have thought of the importance of prolonging life? The relief of suffering forms a part of our duty. One of my old teachers said, when a patient is far gone with cancer, give him morphin. Why? Not to shorten his days, but to relieve suffering. I believe those two tenets, uttered so many ages ago, are just as true to-day as they were when Hippocrates formulated them.

DR. E. W. LEE, Omaha, Neb.—In my connectoin with corporations I have always held the opinion, from personal observations, that they are only too anxious to arrive at a satisfactory settlement in the cases of all injured persons before any litigation is started. I do not think the matter will ever be satisfactorily settled until medical men are appointed by the court to pass judgment on the permanent or temporary disability of the injured, without having physicians called by the defendant or by the plaintiff.

MR. L. L. LOSEY, closing the discussion.—The opinion seems to have obtained from something I have read, that railway companies through their claim departments invoke the aid of surgeons in making settlements. I believe I speak for the railway systems of the country when I say that this is not true, except in so far as to secure a basis; I mean by that to determine the exact physical condition of the sufferer. Dr. Owens will bear me out when I say that I do not believe he knows what I have paid a solitary claimant within the last three years. I never have asked him directly or indirectly what he thought I should pay one, nor has he ever volunteered the information.

Again, a surgeon would be little less than criminal if he attempted to minimize the injuries of any person; he would do a palpable injustice to the railway company. We want to know the exact truth in order to determine what we should do. To show you how far we are from that, and I do not want to bring the blush to anyone, some time ago a woman was injured in a derailment; a surgeon came to me and said she was badly injured. We discussed the matter. He was a relative of hers, and I said that before we made an adjustment—her son was with him—I would like one of our surgeons to examine her. "Very well," he said, "I have no objection." I took a surgeon there to examine her. He did so, came out, and in discussing the matter with the family doctor said to him: "Doctor, what do you think of the case?" He replied: "I think the lady will be in bed for two weeks, and confined to her room for two weeks longer. What do you think?" he asked. "I think she will be in bed three months, and in the room possibly six." I paid five or six times as much for the injury that woman sustained as I need have paid had I submitted the matter to their own people. But I wanted to know the truth.

Dr. Lacey seems to think that everybody is antagonistic to the claim agent. I believe, as a general proposition, that people who are injured, and their friends, who never come in contact with claim agents, do have something of that feeling. I believe the law of kindness is as supreme a law, not only with reference to claimants injured, but in all relations of life, as we have, and that we can succeed through channels of kindness where it is impossible to succeed by any other methods. I believe I may safely say that while I have been approached by claimants and their friends, who were antagonistic at the outset, some of the best friends I have in the world are the people with whom I have adjusted claims. I attribute it to kindly methods. I do not think it is the policy of any railroad to have in its employ men who are ugly and abusive, but, on the contrary, men who are agreeable and who pursue only kindly methods in the adjustment of claims.

RAILWAY HYGIENE AND EMERGENCY EQUIPMENT.

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Coming within the province of duty of railroad surgeons, it may be said with much probability that, unless they take a positive interest in the matter, slow progress will be made in the sanitation and hygiene of railway travel. So far we have devoted ourselves chiefly to the treatment of injuries and the consideration of litigation cases. Especially are the furnishing and ventilation of coaches and first treatment of the injured matters of supreme importance and always worthy of special interest and consideration. It is often a long time after the recognition of an evil before the successful remedy is discovered and applied. The best means in the accomplishment of a given purpose is generally the result of countless theories and suggestions, and careful, patient investigation. The comfort, health and safety of employees and passengers are cardinal elements that must command the serious consideration of railway corporations and the railway medical corps. Should we examine the air of a Pullman coach, with a spectroscope, the myriad living things to the square inch revealed, many inimical to health, would be enough to cause the shades of Schwann, Helmholtz, Kircher, Pasteur and Tyndall to weep for the living.

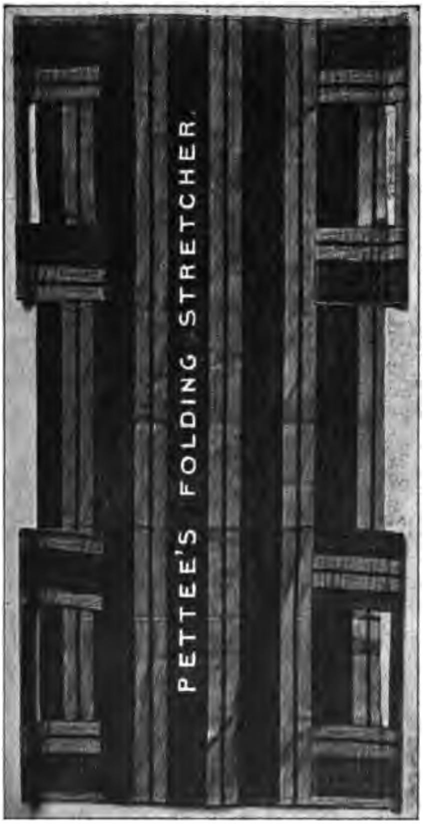
The ventilation of houses and public buildings has never been easily accomplished, but that of a moving car is a matter of more than ordinary difficulty. The transom-window near the top promptly admits more smoke, cinders and dirt than pure fresh air, and is not a very satisfactory device. The sudden, frequent and extreme change of temperature—generally when passengers and porters are asleep—is a fruitful cause of colds and sickness. The current of outside air is much influenced by the motion of the train. The sudden displacement of a large volume of air by the train in rapid motion condenses and gives increased impetus to the air without, which rushes with unusual force through car windows and doors, and always prevents a uniform, comfortable circulation of air within the car.

I may suggest that it might be an improvement if the ventilator windows were opened and closed by a valve-like arrangement, made of the usual glass and wooden frame and fastened by hinges at one end, preferably toward the engine, on the outside, while on the inside a similar one may be placed, with the fixed, or hinge, end in a reverse direction; a fine wire screen might be placed between. This arrangement would occupy as little space or less than the tilted window now in use. The force and volume of the air current would be broken, and the inside air would be less subject to violent disturbance, and less smoke and dirt would enter the car.

The only perfect remedy for part of the evil is the more complete combustion of fuel and smoke, which is eminently desirable, not only as an economic measure of great value, but in behalf of the comfort and health of the traveling public. Railways and road makers will exhibit commendable concern for the well-being of employees and passengers and the protection of cars and equipment if the top covers of roadbeds is composed of hard dirt, or at least something better than cinders and fine gravel. Experiments now being made with crude petroleum may prove satisfactory in allaying this nuisance.

It may be of interest to state what few seem to know, how the furniture of cars is cleaned. It is done by compressed air forced through hose, with a nozzle, and a slit in the latter. By running this over cushions, blankets, drapery, etc., the dust and loose dirt are effectually removed. But this does not meet the indications as to disease germs and the prevention of infection. I have recently seen, on Pullman coaches, two cases, and they are common, which strongly illustrate the necessity of more positive action to protect the public against infectious diseases in railway transit. One was a patient with scarlet fever, lying in a berth all day, exposing every person in that car and in particular those who might occupy that berth soon after. The other, on another road, was a patient with advanced tuberculosis. She should never have left home, but like many others was, as a last resort, put on a Pullman car (at noon) and a berth prepared for her, as she was too weak to sit up. She was coughing and expectorating constantly. Nothing but boiling water, or fumigation with some antiseptic, such as formaldehyde gas, could make those berths safe for the next occupants.

In some investigation and correspondence as to what



action is officially taken by the Pullman Company to protect the public from infectious and contagious diseases, I am able to state on the authority of the general superintendent, at Chicago, that "no printed regulations or instructions to employees, relating to hygiene, protection of patrons from contagious diseases, nor in reference to car cleaning, have been issued, though it is admitted best that cars should be fumigated after being occupied by a consumptive. Instructions were issued to district superintendents, in 1898, that all cars running into Colorado and California should be fumigated at least once a month. My investigation and information is to the effect that employees report few cases of contagion or infection, even if recognized, which is not often; that blankets are seldom washed or fumigated, and that no complete or systematic effort is made by the company or corporation to meet the condition in either a scientific or thorough business manner. The whole question is treated in a perfunctory sort of way. Besides, it must be manifest that the employees can only detect infection, if at all, in the most advanced or pronounced cases.

Fully half of the state boards of health, the American Public Health Association, and the General Baggage Agents' Association have formulated very rigid rules governing the transportation of dead bodies. Those dead of smallpox, cholera or yellow fever can not be shipped. Those dying from ordinary infectious and contagious diseases can only be shipped after the thorough application and injection of antiseptics, the body put in an air-tight case. These rules are in the main commendable. With their execution there is no danger to employees or to the public. But I may be pardoned for noting the grave inconsistency in the treatment of those bodies for shipment and the transportation of the living subject. The time will doubtless come when people suffering from infectious and contagious diseases will travel in cars or compartments specially provided for them. At present there is but one considerate course for railway companies to pursue, and the only safe one for the public, and that is not only the cleaning, but the disinfection, of coaches and furnishings with every trip. This is of special importance to those roads going to the health resorts of the country.

The importance of renovating and disinfecting a house that has been inhabited by patients with a *contagium vivum* is not to be questioned, and the necessity exists with as great force, certainly, to the more closely confined and vitiated air of passenger coaches and Pullmans, containing at least a surplus of carbonic acid gas and a minimum of oxygen.

It must be conceded that the materials used in furnishing railway coaches—plushes and velvet cushions, woolens and draperies of every kind—afford the best possible nidus for the protection and preservation of germs, and they are also the most difficult to clean. Every consideration of hygiene and the public health demands their abolition for such purposes. Cars can be finished and furnished in material with a smooth surface, such as hard wood and leather, which can be more easily, perfectly and quickly cleaned, and yet be as elegant as the most refined taste could desire. Less carving and embossing, less plush and velvet and drapery that protect and preserve filth is the dictate of every principle of hygiene. The railway company, with its army of employees and passengers, should be fully abreast of the time in word and action in its humanitarianism, which demands that adequate and suitable preparation shall be made for the immediate care and comfort of the injured.

Railway accidents are common and injuries frequent, yet few roads are prepared to meet these exigencies promptly and well. Herrick, in *Railway Surgery*, recommends a small tin box with four roller and four triangular bandages, sterilized gauze and a solution of morphin and strychnin for every train. Litters are advised for certain stations.

Whatever conduces to the comfort and health of passengers evinces a thoughtful regard on the part of the company that is commensurate with its responsibilities. Such a sense of obligation is certain to meet an appreciative response on the part of the public. When a train starts on its journey, it should be supplied with a box containing at least half a dozen first-aid packets similar to those supplied to the army, besides a few roller bandages and splints of felt, or binders' board, and absorbent cotton. The emergency package should contain at least a folded strip of sterilized gauze about three inches wide and twelve inches long, a wad of absorbent cotton, an envelope with a dram or two of antiseptic powder, composed of salicylic and boric acid, in the proportion of about 1 to 4—as recommended by Senn—and a strip of rubber plaster one by eight or ten inches. The powder should be applied directly to the wound, covered by cotton, and a pad of gauze held in place by the plaster. The bandage may be applied over all. This should be done at once, in the car or on the ground, and employees should be instructed as to the use and application. It should be remembered that it is sometimes hours before the service of a physician or surgeon can be secured, and the prompt use of the first-aid dressing would undoubtedly be the frequent means of preventing infection of the wound, and in consequence assure an earlier recovery.

For handling and removing a patient to a place of safety, there should be a litter with every train. I have the pleasure of presenting for your inspection and consideration two simple, convenient and inexpensive emergency stretchers, the recent invention of an old soldier of the Civil War, J. W. Pettee, of Denver, Colo. They have the endorsement of the regular army surgeons and officers of the Department of the Colorado, and of the surgeons and officers of the National Guard of Colorado. They will fill a useful place in certain army contingencies, in hospitals and in the medical department of the railway service.

The small hand litter is fifteen by nineteen inches, and weighs eight ounces. The large one is about six feet long and nineteen inches wide, and weighs about two pounds. The former can be used by one or two men, the latter by two or four. The large one can be so folded as to supply the place of the small one, which can be dispensed with. They are made of strong ducking, and have short, hardwood handles. This stretcher is the first of its kind and will especially fill a needed place in the surgical equipment of the railway service.

The improved ventilation, better and more uniform heating of cars, though the latter is largely a matter of management, clean water tanks and the occasional flushing of drains with antiseptic solutions, higher regard for the public health in the equipment and management of cars and the railway service as to infectious and contagious diseases are matters of too much concern to be treated indifferently. These, with proper preparation and regulations for the treatment of the injured, I have deemed it appropriate to commend to the considerate attention of railway officials and surgeons. The criticisms and suggestions are made in the firm conviction that those who promote and manage railway enterprises have a conscientious regard for the public weal, and will correct evils when their existence is known; while the life, service and aims of medical men find them always willing advocates in every effort for the alleviation of suffering and the promotion of needed reforms.

VALUE OF FORMALDEHYDE IN THE DISINFECTION OF BUILDINGS, ROOMS AND CARS.

BY JOHN E. OWENS, M.D.
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CHICAGO.

During the summer of 1898, with the assistance of Mr. Ready, of the laboratory at St. Luke's Hospital, Chicago, I made some experiments with the German 40 per cent. solution of formaldehyde. We selected a room containing 500 cubic feet of space; one sheet was suspended by one side, from a cord stretched across the room. The other articles used were the solution of formaldehyde above named, and the atomizer recommended for use in cars and other places, and used by the Board of Health of Chicago. Three varieties of microbes were selected—the bacilli of anthrax (woolsorter's disease, very fatal to the human being), and those of typhoid and diphtheria. It requires a high degree of heat to destroy the spores of the anthrax bacillus. Six small aluminum cups were half filled with sterilized blood-serum in a state of coagulation; a platinum wire sterilized by heat, when cold, was drawn across the culture of anthrax and the serum in two of the cups inoculated with the same by two scratches. The wire, having been again sterilized by heat to destroy the anthrax bacillus, was used in the same manner in inoculating two other cups with the diphtheria bacillus, and after having been again sterilized by heat the remaining two cups were inoculated with the bacillus of typhoid fever. Three of the cups so inoculated were kept in the room at ordinary room temperature. Three others were placed on a small table in the center of the room above referred to. Across the room, as above stated, one sheet was hung, on which was thrown eight ounces of the solution of formaldehyde. The window and door having been closed, two newspapers were crowded in a space of about three-quarters of an inch, intervening between the lower end of the door and the floors. No effort was made to close the key-holes or to pack cotton around the window frames or doors. Some smarting of the throat, the inside of the nose and eyes was noticeable at the end of the atomization. The room remained closed for 5½ hours. At the end of this time the exposed cups—exposed to formaldehyde—together with the three cups left in the other room, were placed in an incubator at the temperature of the human body. At the end of forty-eight hours a rich growth of each variety of microbe was observed in the cups, respectively, that had not been exposed to the formaldehyde gas, and no growth whatever appeared on those that had been exposed to it. One could observe only the strokes of the wire on the blood-serum of the exposed one, while each of the non-exposed cultures showed a rich growth of each variety. The same experiment was repeated, the only exception being that in the second experiment we used only four ounces of the solution and packed two towels under the door-space. The result was the same as has just been described. A third experiment was made, similar to the last, except that we used only two ounces of formaldehyde solution, and it was gratifying to note that the result was the same—namely, that two ounces of the 40 per cent. German solution of formaldehyde, thrown into a room containing 500 cubic feet of space, were sufficient to destroy the microbes above named, and to absolutely prevent the colonization of these microbes when the exposed cups had been placed in an incubator.

In May, 1898, two agar plates were prepared and inoculated at the same time, with the bacilli of icteroides (Sanarelli—yellow fever). One plate was exposed and subjected to the same experiment; the other plate, in the meantime, remained in another room unexposed to the gas. At the expiration of 5½ hours the two plates were incubated for forty-eight hours; the non-exposed cultures showed rich growth, the exposed cultures nothing more than the inoculation stroke. The culture afterward made of the latter did not show any growth after twenty-four hours' incubation.

It having been reported that formaldehyde does not act on the bacilli above named when dry, we made the following experiment, with anthrax spores, diphtheria and typhoid bacilli: A platinum loopfull of each was spread on clean slides and allowed to dry. These slides were then exposed in a room containing 1440 cubic feet, in which an ordinary bed sheet was suspended. Seven ounces of the formaldehyde—40 per cent.—were thrown on the sheet with a spray. The room was then closed, and after 5½ hours the slides were removed and the film dissolved in a drop of sterile water. Agar was inoculated with this by means of a sterilized platinum loop. After 36 hours' incubation, at 37 C., there was absolutely no development of colonies.

I have attached to this report Circular No. 8, Surgical Department, Illinois Central Railroad Company, issued Oct. 1, 1898, which is as follows:

INSTRUCTIONS GOVERNING USE OF THE FORMALDEHYDE APPARATUS FOR DIRECT APPLICATION OF THE SOLUTION IN THE DISINFECTING OF PASSENGER AND FREIGHT CARS.

1. Suspend the two sheets found in the outfit by their edges from the roof of the car, or the bell-cord, by means of the clothes-pins. The sheets should hang their full length and be placed so as to equally divide the space in the length of the car.

2. Close the doors and windows.

3. Saturate both sheets with spray from the bottle, standing with the nozzle about eight feet from the sheet and throwing the spray against it, with the left hand directing the nozzle, supporting the tube where it passes from the bottle, and working the bulb vigorously and rapidly with the other hand. Commence at the top of the sheet and use half the required quantity of fluid on each sheet.

4. For disinfecting passenger and baggage cars, fill the spray bottle with the formaldehyde solution furnished. For disinfecting freight cars, use the bottle one-half full.

5. As formaldehyde is quite irritating to the hands and eyes, those using the solution are instructed to exhaust the spray quickly, leaving and closing the car as soon as possible. Caution should be exercised not to get the liquid on the hands or in the eyes, and not to inhale the vapor any more than is absolutely necessary.

6. Leave the cars locked tightly for at least five hours after spraying, and, if possible, allow eight hours to elapse before opening.

7. On opening, take down the sheets and clean the car in the usual way. If any spots are left on furniture or polished woodwork, by the formaldehyde, wipe them off with a wet towel and use furniture polish. If the sheets are still moist, they should be dried in the open air, but not washed until sufficiently soiled.

8. For disinfecting spaces other than cars, such as baggage-rooms, etc., the same method may be used, employing one bottle of the formaldehyde for every 4000 cubic feet of room space, and one sheet for each 2000 cubic feet.

Approved: J. E. Owens, Chief Surgeon.

A. W. Sullivan, General Superintendent.

The directions for the use of the 40 per cent. German formaldehyde solution and the convenience, simplicity and cheapness of the apparatus recommended are fully borne out by the experiments above referred to. Two ounces of the 40 per cent. German formaldehyde solution, thrown into a room of 500 cubic feet of space, is equal to the full of the regulation bottle of formaldehyde on two sheets in a room containing 4000 cubic feet of space (see Rule 8 of Circular No. 8). These experiments would seem to favor the opinion that formaldehyde thus used may be the ideal disinfectant.

I can not close this report without stating that the Board of Health of Chicago has made such experiments as justify them in the use of formaldehyde, and in the high estimate which they place on its value. The spray apparatus, which is illustrated, is the one used by the Board and the one which we have adopted for use on the Illinois Central Railroad.

DISCUSSION.

DR. J. T. ESKRIDGE, Denver, Colo.—In connection with this paper I have a suggestion to make. It is well known that formaldehyde is exceedingly irritating, and I believe that by using a steam atomizer with a certain amount of alcohol in it, the vapor would not be so disagreeable and irritating to the disinfector.

DR. E. W. LEE, Omaha, Neb.—There is an apparatus on the market which generates or gives off formaldehyde in the form of a spray, and there are also formaldehyde lamps which emit vapors. I have forgotten the name of this apparatus. It can be set going in a room, the door locked, and subsequently opened very cautiously, because the disinfector can not very well stand the irritating fumes of the gas and he can not remain in the room for any length of time. I would like to ask Dr. Owens why he prefers the solution instead of the vapor.

DR. W. RUML, Cedar Rapids, Iowa—I would like to ask whether any of the members of the Academy have had experience in using formaldehyde for surgical dressings. I have been using it for this purpose during the last two years in solution, varying from .125 to .25 per cent., for washing and cleansing the tissues. Then the dressing of sterilized gauze, saturated in a .125 per cent. of the solution, is applied in the usual way that we apply gauze dressings. There is no odor from it, and the wound is clean. If there is any sloughing, the slough is dry, and the dressing comes off absolutely clean. The sloughs are apparently mummified, and are allowed to remain until such a time as easily removed, sometimes from ten days to two weeks. When the sloughs are removed, the granulations are not only found healthy, but healing is well advanced. The usual method is to cleanse the wound thoroughly with formalin soap, 1 per cent., then wash with sterilized gauze saturated in .125 per cent. of the solution. The only disadvantage is a little smarting of the wound for a short time. At first I used a .5 per cent. solution, and felt that perhaps it increased the sloughing. However, the slough is mummified, clean, and there is no pus.

DR. WILLIAM C. BANE, Denver, Colo.—I have been using formalin—40 per cent. formaldehyde—in the strength of from .2 to 1 per cent. solution in my eye and ear work, and to me it has proven most satisfactory. In the eye it is somewhat irritating, but in cases of ophthalmia neonatorum or mucopurulent conjunctivitis, I have had very good results from its use.

DR. W. H. GERMAN, Morgan Park, Ill.—I would like to ask the reason why the Chicago Board of Health has abandoned the use of formaldehyde vapor and is now using the spray.

DR. B. F. CRUMMER, Omaha, Neb.—One or two questions have been asked, and I will try to answer them. One is with reference to the difference between the spray and the vapor of formaldehyde. For convenience and cheapness there is no comparison between the two. The little lamps that are sold are absolutely useless; the larger ones are expensive, and it takes considerable time to use them with satisfaction. There is nothing simpler than to saturate the sheets after the manner recommended and advised by the Chicago Health Department. In our efforts to control an epidemic of smallpox in one of the towns in our state, the inspector began with the little lamps and found them unsatisfactory. He soon rigged up a large, ordinary force-pump, saturated the sheets with formaldehyde, and in a short time there was enough gas generated to effect complete disinfection of a room by this process. This plan of disinfection was carried out in a town where we had an epidemic of 400 or 500 cases of the disease. The Board of Health of Nebraska has adopted that plan in preference to the lamps, as a matter of economy and efficiency.

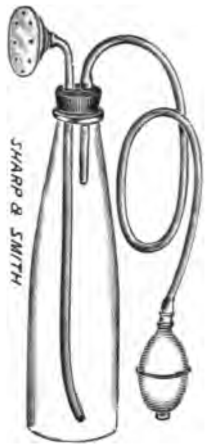
DR. W. W. GRANT, Denver, Colo.—The time is not far distant when railroads generally will have to adopt some general systematic means of cleaning and disinfecting cars, and formaldehyde is probably the very best agent that can be used for that purpose, but to be effective, it will have to be used in the form of fumigation. I do not know exactly what the effect of formaldehyde gas would be on the furnishings of railway cars, but railway men do know, and in that respect the construction will have to be, in the future, with a view to comfort and health first, and not, as is now largely the case, for mere elegance, because much of the furniture of our passenger and Pullman coaches is wholly unnecessary and even prejudicial to the health of individuals. In some respects the furnishings are much more expensive than they need be, and railroads will be forced to adopt simpler and more healthful things, such as suggested in my address. The material used in our railway cars, as is well known, is exceedingly difficult to clean, and the agents necessary to destroy germs will often destroy the furniture, and the officials of our railway systems will have to adopt some plan of furnishing cars to meet the modern demands of hygiene and sanitation. The cleaning of material and furnishings of cars with compressed-air does not affect the moisture and germs of diseases which may remain. I found, from my investigations, that the blankets are seldom washed or cleaned in a Pullman car, consequently reforms will have to be made in this regard; the public will certainly demand a change, and the railroads will have to comply with these demands. From the instances mentioned, everyone must know that any child, or adult, susceptible to diseases, would be endangered by the furnishings of a berth, to say the least, if they had not been entirely cleaned and fumigated after having been used and occupied by an infected patient.

Dr. J. T. Eskridge—I would like to ask whether anyone knows of a case on record where a railroad company has been sued by a person who has contracted disease in its coaches.

Dr. L. E. Lemen, Denver, Colo.—I can understand that, as far as the railways are concerned, an apparatus could be constructed with which a car could be effectively fumigated by compressed air with the gas. It is something that should be taken up, advocated, and recommended by this Academy to the different railway corporations. When we undertake to fumigate from house to house, as boards of health have to do, it is a little different. A tank could be constructed containing compressed air, so that a car could be sidetracked and thoroughly disinfected in a few minutes by means of a hose, and a dozen or fifteen cars could easily be disinfected in the course of half a day.

Dr. J. E. Owens, replying to the question of Dr. Eskridge—There has been no such suit instituted to my knowledge. This method of disinfection has been in operation on the Illinois Central since October, 1898, and I have reason to believe that the effects of the formaldehyde gas on the furnishings of cars are *nil* in all respects. Should any of the furniture be slightly discolored in consequence of contact with the gas the discoloration or staining can be readily removed, as stated in the paper, by a dry cloth and a little furniture dressing or oil.

As to the relative merits of the spray and vapor, when I returned home from my vacation a year or more ago, I found that the Illinois Central had purchased an atomizer in New York, or a vaporizer, which cost $100. It was put into use: The method was to place this apparatus at the door, put slender pipes through the key-hole and throw the vapor into the room. Then there is a lamp with a single generator advertised by a Chicago firm. With this apparatus it is claimed that one can thoroughly sterilize 2000 cubic feet of space, and by means of the double generator, double the amount of space in the same time. The single generator costs $7.50, the double $15. It is made of copper and glass. I can say from my own experience that the generation of formaldehyde by the vapor apparatus is not always reliable. Much seems to depend on the quality of the alcohol, on the degree of heat, and many other things which I am not capable of answering from a chemical standpoint. For that reason I can not indorse the generation of this vapor by



such means. But I illustrate an apparatus, made by Sharp & Smith, at $9 a dozen. It takes two clothes-pins for each sheet and a double sheet will cost about 35 cents. It is simple. It can be used by switchmen, brakemen, or a general utility man about the station. It can be carried readily from one place to another, into a baggage-room, into cars and there is very little loss, if it should be broken. We have a few in stock and they can be quickly replaced. As soon as we diffuse the spray over the sheets, spread out on a large surface, the gas comes from it in great volume, and that is the essential thing after all. In order to prevent irritation of the upper air-passages, everything should be made ready in the car or room previous to the use of the spray, so that a prompt exit may be effected. As soon as there is a tickling of the nose and fauces, with irritation of the eyes, it is time for the man who uses the spray to leave the room. My eyes are sensitive to slight irritation, but I found that this irritation soon passed away after going into the non-medicated air. I presume that if a man were using the formaldehyde vapor all the morning in cars it would produce some deleterious effect.

Dr. Lemen—What are the toxic effects of the disinfectant internally, or following an overdose by inhalation?

Dr. Owens—I do not think anyone could remain in a room sufficiently long to get the toxic effects of formaldehyde by inhalation. The effect is locally on the upper air-passages and eyes.

Dr. Arthur L. Wright, Carroll, Iowa—Have any experiments been carried on with a view to determining the effect of formaldehyde on pus microbes?

Dr. Owens—I am not informed of any such experiments. With reference to the surgical use of formaldehyde I have had no experience, but I understand that it is of more or less value in the surgical treatment of wounds, as stated by Dr. Ruml.

TREATMENT IN COMPOUND, COMPOUND COMMINUTED, AND NON-UNION OR UNUNITED FRACTURES.

BY C. D. EVANS, M.D.

SURGEON W. P. & B. & M. R'Y CO.; SURGEON TO ST. MARY'S HOSPITAL.
COLUMBUS, NEB.

In placing before this society a simple contrivance for the treatment of compound, compound comminuted and non-union or ununited fractures I somewhat hesitate, for fear that it may be looked upon as an individual or special splint, a fancy of my own, or as so many have, a "hobby." This I must leave for your consideration. This appliance I have used as much for after-treatment where operation was necessary as I have for fractures alone. It is the operation for the ununited fracture to which I wish to call especial attention. I can better describe the operation, splint and dressings by reporting the following case:

Charles L., aged 32, presented fracture of the upper part of the lower third of his right leg. He was a miner, Irish, and with good family history, no constitutional troubles, no previous sickness, excepting in childhood, and no history of venereal nor hereditary disease.

The accident occurred March 15, 1899. He fell from a railroad train, striking his leg against some object.

The leg was at once put in a plaster cast from the toes to the knee, and three weeks later he was taken to the hospital. Two weeks after being in the hospital this cast was removed. The fracture was not united, and the cast was replaced by one enclosing the leg and the thigh. Four weeks later he left the hospital on crutches, with a spint on the limb, suffering pain on motion and exercise in the region of the fracture. One week later, making in all ten weeks, the cast was removed and the fracture found still ununited.

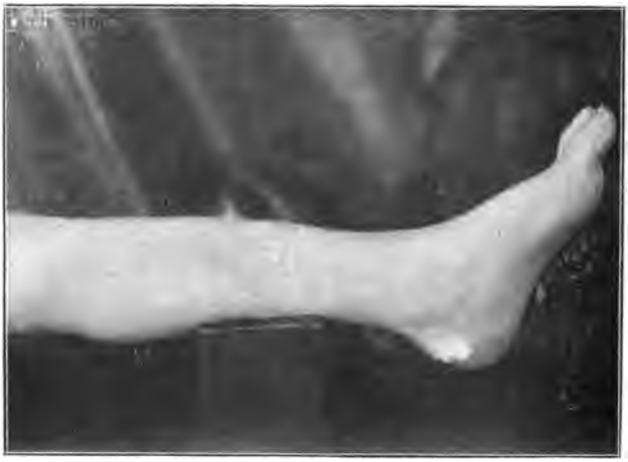


FIGURE 1.

May 31 he came under my care and entered the hospital at Columbus, eleven weeks after the accident, and I found the following conditions: Leg badly swollen and painful small opening in the leg at the seat of fracture, on the anterior surface, and motion of the fragments free. By motion and rubbing of the fragments I could get very indistinct crepitus. After a thorough examination I resorted to the following operation, June 20: The foot and leg were made thoroughly aseptic. On the outer side of the leg, one-half inch from the crest of the tibia and two inches above the seat of fracture, I began the incision, extending it to the inner side and across the tibia two inches, making a short curve; then one was made down the inner side of the leg and beyond the inner margin of the tibia to a point two inches below the fracture; making a short curve as before, it then turned outward across the leg and tibia to a point corresponding to the upper incision. The flap with the fascia was dissected and turned to the outer side and entrusted to an assistant.

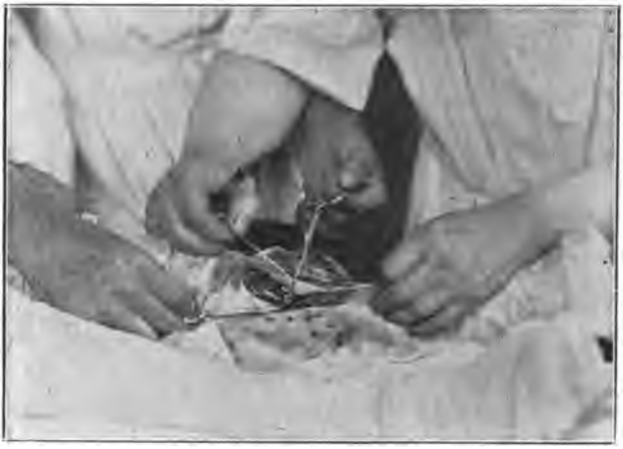


FIGURE 2.

The fibula was found in thoroughly good condition and in my judgment not in need of operative interference. An incision was next made on the crest of the tibia down to the bone, the whole length of the opening. The periosteum was turned back and dissected from both fragments toward the fracture. (The reason I give for this dissection of the periosteum is that I secure more for the recovering of the bone than I would have done by dissecting from the seat of the fracture up and down.) The provisional callus and ligamentous growth markedly interfered with knowing just where the true periosteum began, therefore I saved from one-half to three-fourths of an inch of the latter, which I think would otherwise have been lost. The bone freed of periosteum in this manner, I used a chain saw and removed the thickened growth until true bone was secured. The fracture being a little irregular, I sawed in the line of fracture, in all losing about five-eighths of an inch of bony structure, not enough but that the fragments could easily be approximated. This being accomplished, I drilled, using a small-sized drill, three holes in each

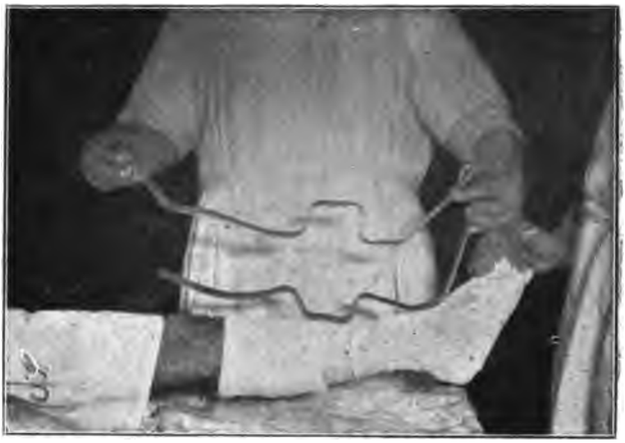


FIGURE 3.

fragment, viz: crest, outer and inner side of the tibia. These holes were directed toward each other so that they would come in exact apposition, and none were allowed to enter the medullary canal. A half-curved needle was armed with No. 3 chromicized catgut and easily passed through the openings in each fragment. The fragments held well together, the catgut securely tied, and the periosteum brought together, the wound was closed by interrupted sutures, dressed with Tursche's powder and bichlorid gauze, and bandaged just far enough to cover the wound. Then the most important part in the treatment of compound and compound comminuted fractures and operations for securing the bone was attempted. Photograph No. 1 shows the leg before operation; Photograph No. 2, operation; Photograph No. 3, the first part of the plaster dressing or splint.

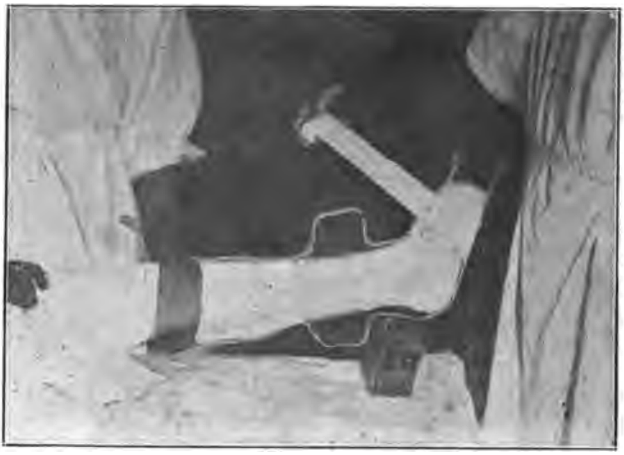


FIGURE 4.

The wound closed by first intention in the patient above, and the cast was removed July 15. A cast was put on to cover the leg from the toes to the knee, to keep the limb firm and to allow the patient to get out of bed. The last cast was removed July 29, and the limb is now in perfect repair and in continued use.

When preparing for the operation I secure what is known as "band iron." This I shape to the sound leg, in this case extending from one to two inches beyond the toes, back two or three inches above the knee. The iron is shaped to fit the leg except that at the seat of fracture I make a loop in the iron so as to raise it about two inches above the wound, admitting a thorough asepsis in after-dressing, should it be required. Having this properly shaped, the operation over and the wound bandaged, I cover the limb as far as necessary with raw cotton, in this case from the toes to the knee. I then enclose the foot and leg as far up as the lower end of the

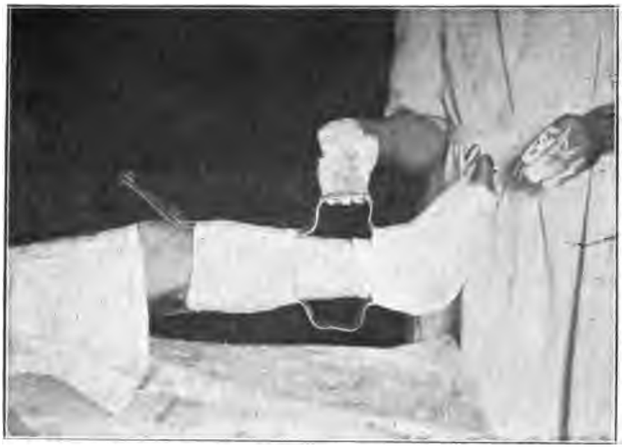


FIGURE 5.

bandages, and also do this from the upper end of the wound as far up as the knee. I then tear the cotton around the leg in the center between the plaster-of-Paris dressing, and over the wound turn it back between the plaster, making a sort of cuff. I do this at the toes and the knee also. The irons are then placed on the anterior and posterior surface of the leg, held securely by two assistants, and firm plaster-of-Paris bandages are applied as before and of sufficient thickness to secure the particular fracture; turning back the cotton in this manner leaves no rough edges. When this is dry I supply the open space between the plaster and over the wound with more cotton and a well-tightened roller bandage, thus leaving the limb with equal pressure from the toes to the knee.

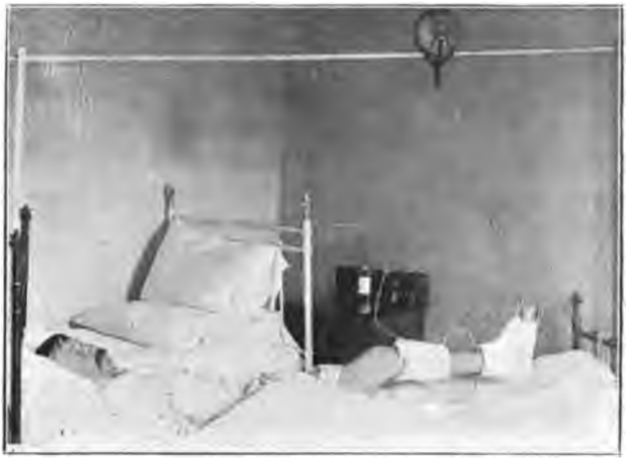


FIGURE 6.

Photograph No. 4 gives an idea of applying the irons. Photograph No. 5 shows the splint complete. The iron on the anterior surface is so bent upon itself that it makes a hook for the attachment of a rope to suspend the limb. This is done by securing two upright pieces about five feet long—one by three inches—to the foot and head of the bed, and with a piece of one-inch rope a little longer than the bed placed in these upright pieces, a pulley on the gas pipe, the rope in the pulley hook, the patient has the freedom of the bed. Photograph No. 6 shows the patient in bed and the dressing removed just before taking off the splint.

There are three principal features to which I wish to call especial attention: 1. The mode of securing apposition of the fragments of bone. 2. The simplicity of the appliance to keep the fragments in apposition. 3. The advantage of dressing the wound thoroughly aseptically.

The only material I used to secure bony apposition was catgut, No. 3. The secret in the successful treatment of this character of injury is to absolutely immobilize the fragments after securing apposition, and not forcing the bony structure to be subjected to foreign bodies more than is absolutely necessary to reach the object to be attained, that of immobilization.

The simplicity of the splint or appliance to keep the fragments in their position is that the iron can be secured at any hardware store or tinshop, and can be had at all times. The iron is easily bent and moulded to suit the limb and fractures, a little mechanical ingenuity and practical knowledge of anatomy are all that is necessary to make it a perfect success.

The mode of dressing the wounds can be made absolutely aseptic. Two pieces of rubber dam, 8x12 inches, with a V-shaped piece cut out of the long side, the V-shaped piece being a little less than the diameter of the limb, and sterilized at each dressing, should be drawn tightly around the limb at the end of the plaster dressing, and under the iron and securely fastened by safety-pins; the rubber turned back, forming a cuff over the plaster cast, admits of thorough washing and dressing.

Just a word more regarding compound and ununited fractures: There are many authors and individual writers who say that injuries of this character should never be enclosed in plaster-of-Paris dressing. While this is true in part, they fail to tell us by what absolute measures we can secure the limb by external appliances. The rule I follow in compound and compound comminuted fractures is first to reduce to a simple fracture, and under the greatest aseptic measures. I have used this appliance for compound, compound comminuted fractures, and splint or dressing for the upper as well as for the lower limbs, for some years, and have never had a failure, although, with this appliance, I provide for failure, in this: that should any derangement of the soft tissues occur, or the fracture prove unsatisfactory, the wound can be dressed and redressed with the fragments in perfect apposition.

It would seem to me that the most important part in the treatment of this character of injuries and the after-treatment of operative measures for this class of operations is to have complete control of the limb by external appliances, and in no way jeopardize the limb or the patient by using foreign substances in the bone. Therefore, I want to say more particularly, to bring out the sentiment of this society, in full discussion, that the day for using wire sutures, ivory pegs, iron nails, clamp screws, or any other foreign substance in bony structures that will not readily absorb, more particularly where the soft parts are kept open, is fast drawing to a close.

I make reference to fourteen other patients, the ages varying from 14 to 60 years.

DISCUSSION.

Dr. Thomas B. Lacey, Council Bluffs, Iowa—In regard to the strap or band around the splint as suggested in the paper, I am inclined to think it is simply a modification of the old method used in applying interrupted plaster-of-Paris dressing for fractures, which in some text-books is illustrated in much the same way, with loop made, if necessary two loops, and a little turn by which the limb can be suspended from pulleys in the ceiling or by anything crossed over the bed that gives a chance to attach to it.

As to the use of catgut to secure apposition in the case mentioned by him, it occurs to me that the catgut does not amount to very much as the essayist applies it, except in one particular, namely, that it holds the ends of the fractured fragments in apposition until he can apply his dressing, then he has no further use for the catgut. It may take him three-quarters of an hour to apply the dressing and have hardening take place, so that the external apparatus will retain the fractured fragments in their position. It occurs to me that this is all catgut is expected to do in this case, and that it simply holds the fractured fragments in close apposition until such time as the fragment has been hardened, and at the end of an hour or more he has no further use for the catgut, and it serves no further purpose. Whether we would be satisfied with the use of catgut or any other suture material, and have its purpose ended in one hour, and from that time on have it serve no further purpose, there is room for doubt. I would like to use some article in its place which will at least give us forty days' partial support, in addition to the dressing that he suggests in his paper.

Dr. W. W. Grant—What do you secure it with?

Dr. Lacey—The essayist says that he does not use wire, I believe, but wire is used extensively and frequently in these cases. The use of wire has been suggested by Dr. Lemen, and while I do not wish to anticipate him in the discussion of this paper, he suggests the use of silkworm gut, which will persist and give support. I think the ivory pegs are good; they will in a measure be absorbed, but we must be absolutely sure that they are thoroughly aseptic before being placed in position. Whatever we use should be introduced in such a way that the medullary canal is entirely avoided. In some of our text-books reference is made to the use of silver or plated wire. I think copper wire plated with silver has a greater tensile strength than silver wire itself, and that it will, perhaps, serve a better purpose. However, in some of our text-books you will see by the description and by the plates used, that the wire is at times passed directly through the full diameter of the bone, it, of course, passing through the medullary canal. This is objectionable and is the source of considerable trouble, as well as failure, in many cases in which failures are reported. It is easy to avoid the medullary canal, either by boring from the end of the fragment upward and to the surface, or by drilling through, just taking the compact tissue, and going sufficiently high to avoid passing through the medullary canal.

As to the use of wire, silver wire alone is a rather difficult thing unless you use large-sized wire, or unless you take two or three strands of moderate size and twist them together, making one cable, because silver wire, although you place it in position and get close coaptation for the time being, breaks too easily. If it should break in manipulating it, it would do absolutely no good and had better be out. Plated copper wire has, therefore, greater tensile strength and will not break so easily.

Dr. Lemen, Denver, Colo.—In regard to the treatment of fractures, there are three cardinal principles which should invariably be observed: 1, the diagnosis; 2, apposition, placing the fragments in accurate apposition; 3, retaining the fragments in position. In order to hold a fracture in apposition, you must have what we call a fixed dressing. A dressing that is absolutely fixed, which retains the fragments in position, is what we desire. I must criticise the Doctor's application of the plaster a little. In a limb that is entirely encompassed by a plaster-of-Paris dressing, it may be applied ever so snugly and thick at the time, yet in forty-eight hours after, owing to drawing out of the dressing and of pressure on the muscular tissue, more or less shrinking of the limb is produced. Then you have what is supposed to be a fixed appliance, but one that is badly in need of fixation; in other words, you have motion. In such cases catgut does not retain the fragments in position sufficiently long. The dressings, strings, or wire must be used longer than one hour. You will have good results where there is more or less motion. The more motion you have, the greater will be the amount of callus thrown out. You will have union. I have used ivory pegs; I have likewise used iron nails for uniting the fragments, but for the last six years I have employed silkworm gut, because it is stronger than silver wire. When you use the latter and twist it and tie it tight enough to make perfect apposition, you have a large knot which is a menace to the soft parts. By using silkworm gut and making three loops, bringing it taut, it holds firmly. It makes a buried suture, and Nature takes care of it. I have never had an opportunity of dissecting these wires afterward, to see the results, but I know that my results have been good. (Here Dr. Lemen demonstrated his method of treating a fracture in the middle or upper third of the leg.)

Dr. W. Ruml, Cedar Rapids, Iowa—In treating a fracture below the knee it is very important to fix the knee-joint as well as the ankle-joint. I do not hesitate to apply a plaster-of-Paris dressing at once. In a case of compound fracture I thoroughly cleanse the wound, apply a large gauze dressing and absorbent cotton. In applying the plaster I use a roller gauze plaster-of-Paris bandage, and run it up well above the knee. I believe it is absolutely impossible to retain the fractured fragments in apposition without fixing both joints; in other words. completely immobilizing the fracture. The patient is kept in bed with the leg slightly raised, knee slightly bent; thus lessening tension on the heel tendons. If the cast does not include the knee-joint there is the possibility of a man moving the leg in the cast. If the knee-joint is fixed, however, this is overcome. I use iron wire in wiring bones, and what is called stove-pipe wire. I find it efficient. I use sutures ordinarily in the manner described by Dr. Lacey, but the most important part is the after-dressing, which should immobilize the fractured fragments.

Dr. E. W. Lee, Omaha, Neb.—I wish to emphasize what Dr. Lemen has said in regard to the plaster-of-Paris bandage; instead of having it entirely encircle the limb, I would have it in the form of a side splint, so that it can be readjusted as the atrophy of the muscle takes place, from pressure and swelling becoming reduced. The plaster-of-Paris bandage can then be adjusted and brought into closer apposition to the limb, and in consequence the limb can be immobilized.

With reference to the use of silver wire, my experience has taught me that it gives very little trouble, and that there is very little danger, if any, of going through the medullary canal. A case that impressed this very firmly on my mind was one of compound comminuted fracture of the humerus, produced by a pistol ball, and in which non-union was the result, owing, in the first place, to a portion of the ball remaining between the fractured ends, so that when the case came under my observation there was a discharging sinus and ununited fracture. I opened the wound, and removed the portion of the ball that remained—about half of it: the fractured ends were soft and granular; I brought each fragment from outside the skin, cut them off slantingly, brought them together, and put four holes through each fragment clear through the bone, inserted a large silver wire, about the size of the largest string of a guitar, and twisted it, giving each one three or four twists, left about one-quarter of an inch twist, and brought it next to the bone where I peeled the periosteum back, and the arm then was in this position (illustrating). The patient was still under an anesthetic; I took the arm, held it in this manner (illustrating), and the silver wire held the bone, so that the arm did not sustain its own weight. I then used ordinary antiseptic dressings, and within forty days the man was able to use his arm, and has had a strong one ever since. The silver wire became encysted and has caused no irritation whatever. I do not use the solid silver wire, but copper wire silver plated, and in that case it worked eminently satisfactorily; I see no reason why we should not continue to use it.

So far as catgut is concerned, unless we have absolute confidence in it, it is liable to prove a source of great danger.

Dr. James A. Quinn, St. Paul, Minn.—I wish to say that in the past six months I have wired more than a dozen bones in cases of delayed union, or what I would call non-union. I have used copper wire plated with silver, which I prefer on account of its tensile strength. While I have gone through the medullary canal, I have not seen any untoward symptoms from so doing, and the testimony of my patients is satisfactory. If catgut can be so prepared that it will last and not be absorbed inside of forty days, preferably sixty days, I see no objections to it. On the contrary, I would welcome it. I have used silkworm gut in these cases, but my preference is copper wire silver plated. Its tensile strength is very much greater than that of silver itself. It has happened to me more than once, when everything was approximated, to have the limb sag and the silver wire break. I am fond of the use of plaster-of-Paris, and I employ it daily and invariably.

Dr. C. D. Evans, closing the discussion—In regard to the medullary canal, I based my statements on what I have seen, and I think that the surgeon who opens the medullary canal to put in a wire suture of any kind is not doing up-to-date surgery. There is no long bone in the 12-year-old subject but can be wired with catgut, or, as Dr. Lemen prefers, with silkworm gut, and when we have a fractured bone we have enough injury to the tissues without the surgeon wilfully making more. The object of the surgeon is to save further injury instead of making it. The fixation of the limb in this splint that I suggest is practically a partial covering of the limb in plaster, and we have all seen, after the application of plaster-of-Paris dressings, as well as of others, the awful mess that is made by soiling these dressings, either by the discharge from the leg or by washing the wound. This splint I have shown you absolutely provides for cleanly dressing; you do not soil the splint, while the wound is absolutely aseptic all the time. In the photograph that is presented you will notice the limb suspended. This suspension can be applied to the arm as well as to the leg. Even if the splint becomes loose, the leg is in a position where the fragments of bone can not become misplaced. The application of plaster-of-Paris after the manner suggested by Dr. Lemen and Dr. Lee is not scientific, because you can not dress the limb, if necessary. In dressing, you make a smear, you fill it with all sorts of things that may tend to injure the bone or soft parts, and it is absolutely impossible to keep it clean.

DR. LEMEN—I put on a dressing and usually a rubber dam over the opening the same as you do.

DR. EVANS—You did not explain that in your previous remarks. When you apply plaster-of-Paris on a leg from the toes to the knee and suspend the limb by pulley, you have fixation at the knee-joint so long as the limb is suspended and the patient is in bed. This splint provides for nutrition while loosening of the limb or atrophy is taking place. I always like to see a little loosening in the upper part of the splint or around the limb from the atrophy that is taking place, because it admits air. and that air is nourishment to the limb.

SILVER CATGUT AND HOW TO TIE IT.

BY EDUARD BOECKMANN, M.D.
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At the meeting of this Academy in Chicago, two years ago, I expressed it as my opinion that ideal catgut had not been discovered, in spite of assertions to the contrary from certain quarters. It was universally admitted at that time that ideal catgut should be, among other things, also antiseptic, to deprive it of its qualities as a culture-medium in the human anatomy for the ever-present bacteria. To this end catgut has been treated with different chemicals, as carbolic acid, sublimate and iodoform. Aseptic catgut, rendered antiseptic with one of these agents, has certainly undergone a great improvement in the direction of ideality, but can hardly be considered ideal, as the carbolic acid is absorbed much more quickly in the tissues than the gut, leaving a culture-medium behind; as sublimate does not penetrate the gut well, forms inert combinations with albuminous substances, and is on the whole an unstable chemical; as iodoform is soon decomposed into free iodin, which makes the gut brown, very brittle and very irritating. Besides, none of these chemicals allows of sterilization of this material by dry heat, and which sterilization should be the last process in its preparation, avoiding all subsequent handling.

I tried to overcome the above objection by impregnation of the catgut with lanolin, and when this proved a failure, by impregnating it with resin, soaking the gut in turpentin oil and evaporating the oil afterward, thus leaving the resin in the gut; neither did this prove successful.

About this time Credé's views on metallic silver as an antiseptic came to my notice, and I grasped his idea with some enthusiasm, as it struck me that we now at least had an antiseptic which would not only remain with the catgut in the tissues to its last fiber but would also allow of sterilization by dry heat as the last step in its surgical preparation. Besides, metallic silver has the advantage of being neither poisonous nor irritating.

In the July number of the *St. Paul Medical Journal* I gave my views on the silver catgut. From the conclusions you will find that I consider silver catgut an almost ideal suturing and ligating material, but that I also admit that it is still open to improvements. The four months which have elapsed since the publication of my paper have also brought about some important improvements, and the catgut I have to-day, for your inspection, is certainly a superior article; still I do not claim for it absolute ideality.

Our demands of ideal catgut are necessarily severe. The raw material must be select as to tensile strength, cleanliness and sterility. Already we here meet with obstacles. The mercantile article is usually very strong, but sometimes has flaws in it, and it does not as a rule look clean, having passed through too many hands, while it is rarely sterile. Ideal catgut must, above all, be both clean and sterile, in other words aseptic. Then it must be antiseptic, and the antiseptic itself should be non-poisonous, non-irritating, able to withstand sterilization by dry heat, and be absorbed proportionately with the absorption of the gut itself, thus acting antiseptically throughout the entire life of the gut, rendering it at all times an unfit medium for the growth of bacteria, and at the same time extending its antiseptic influence to the tract of the gut. Furthermore, the tensile strength must be preserved to such a degree as to satisfy not only that surgeon who uses moderate force in tying, but also that one who practices tight ligation, as the majority persist in doing. Again, the life of the catgut in the tissues should meet the requirements of those who expect a ligature to hold from one to several weeks. The catgut should finally be as pliable as silk, breaks at the knot should not happen, and, last but not least, the knot itself should be made absolutely reliable and of as little bulk as possible.

If all these requirements could be complied with, such a catgut would be ideal and should, on account of its all-important absorbability, render the use of all and every kind of non-absorbable suturing and ligating material superfluous.

To meet the above requirements the catgut is now prepared in the laboratory of the Ramsey County Medical Society in the following way: The raw material, selected for the purpose, is first cleaned by scrubbing it with hot water, soap and sponge, until it looks perfectly white and clean. After this process the catgut will yield cultures in bouillon, but not to the same extent as before the cleaning. It is then transferred to the antiseptic solution. Of late a 2 per cent. solution of nitrate of silver has been used in preference to the 1 per cent. lactate of silver solution, recommended by Credé and has been found to penetrate the catgut just as well. In this solution the catgut remains a week or more in a dark place. Catgut, which is intended to last more than one week in the tissues, the average life of plain silver catgut, is, after cleaning, transferred to a formalin solution for one day, after which the formalin is removed by irrigating the catgut with water from the tap for another day. A 1 per cent. formalin solution is used to make a catgut with the life of two weeks in the tissues, while one of 5 per cent. will make it last several weeks. Catgut, treated with formalin and afterward irrigated with sterile—artesian—water will still yield cultures in bouillon. After twenty-four hours of continual irrigation, the formalized catgut is transferred to the 2 per cent. nitrate of silver solution. The catgut may, formalized or not, remain indefinitely in the silver salt solution without any impairment to its tensile strength. The next process consists in desiccating the catgut, stretching it back to its original length, and reducing the silver salt to black, metallic silver. This is done by stretching the gut on especially constructed frames, which are exposed to direct sunlight in a glass case, where it remains until it is not only dry, but also the most possible brown or black. It is now again tested in bouillon, but has never yielded culture; in this condition it is practically sterile, which is no wonder, as a 2 per cent. solution of nitrate of silver is a germicidal one, if soaked through and through the gut for days. But it must be borne in mind that the gut is now antiseptic and that this circumstance may account for the apparent sterility, for which reason, and because some further handling of the gut is necessary, a proper sterilizing process must come last. After completed reduction of the silver salt into metallic silver, the gut is cut up in desirable lengths, made up in coils, wrapped in paraffin paper, placed in envelopes, which can be sealed hermetically, and sterilized by dry heat. As the catgut is practically sterile, when it is placed in the sterilizer, it has not been deemed necessary to expose it to the spore-killing temperature of 284 F. for three hours, a temperature which is trying to the tensile strength. That of 260 F. continued for four hours or more, is, so far as can be judged from cultural and practical experience, perfectly reliable for the sterilization of silver-catgut.

I have already stated that I do not claim for the silver-catgut which has gone through these different processes absolute ideality, and I shall now give my reasons.

1. Although the strands are tried for weak spots, by stretching before they are placed in the envelopes, it may happen that one strand or another after sterilization may be faulty and easily broken at a certain point, for which reason the strand should be tried again before its application, to avoid disappointment.

2. As the catgut after cleansing still develops growth in bouillon, we may assume that it is only apparently clean and that it still contains traces of bacterial products. However, as far as the practical experience goes, mechanical washing seems to clean the gut satisfactorily.

3. As to sterility, the most important point, there is no doubt that the silver-catgut is ideal in this respect.

4. As to its antiseptic properties, I do not believe that silver is an ideal antiseptic for the gut, although I do believe that it is the best for the present time. It is not poisonous, either generally or locally, and it is not irritating. But, if the catgut contains free silver salt; if this, in other words, has not been perfectly reduced throughout, the gut is irritating. Silver-catgut should

be of a uniform black or brown color throughout, if the silver-salt has been properly reduced. As a matter of fact the silver-catgut is always darker outside than inside; consequently the reduction is not so complete in the body of the gut, and this circumstance may explain why silver catgut sometimes seems to be slightly irritating. Until a reliable and practical method of perfect reduction is discovered long exposure of the gut to bright sunlight will have to serve the purpose. Reduced silver is evidently a weak antiseptic and more so the slower absorbable the gut is. Plain silver catgut is, therefore, more antiseptic than the formalized, but in both the silver is unquestionably able to make the catgut a neutral medium, but not sufficiently antiseptic to prevent the growth of bacteria in its tract. Such an antiseptic would be ideal, and it would allow the catgut to be used with impunity for skin sutures and without being handled "with gloves." In this respect silver catgut is not entirely ideal. Occasionally slight infection is observed, for which the gut itself is in no way responsible; it seems, however, as if the silver contained in it is able to modify, but not to nullify, such infection, judging from the fact that we never see such pronounced stitch abscesses, which sometimes are observed, when plain, aseptic catgut is used in the skin. Infections, occurring when silver catgut is used, should therefore stimulate the surgeon to improve his technique and also stimulate the man who recommended a certain catgut to seek a more ideal antiseptic. After all, we must be satisfied that silver is a stable, non-poisonous and non-irritating antiseptic which is active throughout the entire life of the gut.

5. The tensile strength of silver catgut is beyond reproach. The secret of preserving tensile strength consists in securing absolute dryness of the envelopes before

or during the sterilization, to reduce the dry temperature of 284 F. by some 20 degrees, and to drive off all the formalin in the gut, so treated, as soon as the formalization is completed. If these three points are observed the catgut will come out from the sterilization process nearly as strong as in natural condition. But, as these three points demand the closest attention, mistakes may happen, for which reason the surgeon should try the tensile strength before application.

6. The life of the plain silver catgut has been estimated to be one, that of 1 per cent. formalized silver catgut to be two, and that of 5 per cent. formalized silver catgut six weeks. These figures are arbitrary and must be accepted *cum grano salis.* The finer sizes of catgut are consequently absorbed more quickly than the coarser; the more vascularized the part is, the quicker the catgut is disposed of; it lasts longer under perfectly aseptic conditions than in the presence of sepsis; the dry does not last as long as catgut impregnated with fat, etc. The one-week catgut is, therefore, sometimes disposed of in a couple of days, while the two-weeks' gut may last three weeks or even longer; and as to the six-weeks' gut, I do not really know the exact life, but I assume that it is at least six weeks.

7. It is a *pium desiderium* to prepare the silver catgut in such a manner that it is pliable as silk when removed from the envelope. As it will be very hard to comply with such a wish, the dry and stiff catgut must be rendered pliable by soaking it for a moment in a warm aseptic or antiseptic solution. However, by careful handling such a procedure is superfluous, as the gut will become moist and be rendered pliable by the natural juices of the body. Still, it is to be recommended to dip the gut in a sterile solution just before application.

8. Dry catgut is easily broken at the knot, a circumstance which soaking in a sterile solution and considerate handling will prevent.

9. As to reliability at the knot, silver catgut is perfectly reliable, if properly tied. Some precautions are nevertheless necessary, since catgut becomes very slippery when moistened. It may be possible to impregnate it with an agent which will make an ordinary granny knot or a sailor's knot entirely reliable; this would be very desirable, as these knots are the least bulky. As it is, a surgeon's knot, or double-knot, and three of them, are advisable when an absolutely reliable one is demanded. Or a combined surgeon's and sailor's knot may serve the purpose. I have conducted a series of experiments in tying catgut, which tend to prove that three knots should always be made, and these three may, under particular circumstances, be single or double.

10. Is the putting up of silver catgut in envelopes an ideal way of preserving catgut? I like this method of Benckiser better than any other one. The only objection is that the catgut can not be seen, unless the envelope is opened. And simple inspection will usually tell whether the catgut is free from flaws, whether it is of the desirable size, whether the silver is properly reduced, etc. In these respects it may be of some advantage to put the strands up in glass tubes, which can be boiled together with the instruments, rendering it superfluous to use another person to bring out the catgut from its receptacle. But I shall always insist that it is more ideal to have every strand in a separate receptacle, as sterilization in bulk always endangers the asepsis of the fluid in which the catgut is preserved.

There are consequently several improvements to be made, before we can properly speak of ideal catgut. As it is, the silver catgut is so near to ideality that it can successfully take the place of all other kinds of suturing and ligating material. I have now made exclusive use of catgut in my surgical practice for seven years, and with increasing satisfaction, and I have never for a single moment thought of changing my tactics.

Lowry Arcade.

DISCUSSION.

Dr. J. P. Lord, Omaha, Neb.—The name of Dr. Boeckmann has become inseparably connected with scientifically prepared catgut if I may so express it. We have all used the different forms as they have come to us, and notwithstanding all of the best methods that we have had for the preparation from time to time, yet it would appear to the credit of Dr. Boeckmann that there has still been room for further improvement in catgut. I have followed his methods in its preparation, and have found that some of the objections which he has mentioned obtained in regard to the dry sterilization and the other various preparations chiefly by formalin. I have practically discarded formalin catgut because of its unreliability. Silver wire stands among the first of antiseptic suture materials, it being probably the most ideal suture, as far as its remaining aseptic is concerned, and in this preparation of absorbable material we have the same salt which is to exert its special influence, and it would appear to me that we have here, as Dr. Boeckmann has suggested, an ideal material. I should say it is practically faultless. Even its color is an advantage to it. I can not say more than this in view of the fact that I have not tried it. Its further trial will probably be necessary to determine whether or not it is going to "fill the bill." Dr. Boeckmann has already well stated what there is to be said in regard to it. I am very much impressed with the value of this material, prepared in the manner he has indicated, and am going to demonstrate my faith in it by its practical use.

Dr. E. W. Lee, Omaha, Neb.—There is one point that was brought out in the paper that should be emphasized, namely, that every time we use this or any other catgut, admitting that it is absolutely sterile in every way when it comes into our hands, we must prepare the tissues in the same perfect condition before the catgut is used. A strand may be absolutely sterile, but just as soon as you push it through infected tissue trouble will arise. The use of the cotton glove, which can be easily sterilized, is going to facilitate our work with this suture material and remove, to a great degree, the possibility of stitch abscess. With the most perfect piece of sterilized catgut we are liable to have stitch abscess if the tissues are not rendered perfectly aseptic.

VISION AND COLOR PERCEPTION FOR RAILWAY SERVICE.

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At the last meeting Dr. Pritchard favored the Academy with an article on the "Physical Examination of Railway Men," which included the test for vision and color perception. In the discussion that followed, many valuable points were brought out, and in considering the vision and color perception for railway service I must necessarily repeat some of the facts mentioned at that meeting. For efficient service it is essential that those who give and receive signals have normal vision and perfect color perception.

At the present time no uniform standard exists among the various roads that require applicants to pass an examination previous to entering their service. Their standard varies from a high to a low one. This is not as it should be, for there ought to be a uniformly high standard for physical examination, vision, and also some uniformity as to the colored yarns, flags and lights used. The vision for enginemen should be 20/20, or normal, with each eye, without the aid of glasses, and they should have normal refraction when entering the service. Those who serve as station agents, conductors, brakemen and switchmen should have vision of 20/20 with one and not less than 20/30 with the other eye, without glasses, and be free from hypermetropia of more than one diopter, on entering the service. Enginemen who have been in the employ of a company for five or more years and have proven themselves competent and trustworthy should be retained, everything being equal, if their vision with one eye is 20/20 and the other 20/40, without glasses.

It is a serious question as to what should be done with a trusted engineer, who has been in the service of a company for many years and become thoroughly familiar with his route, when his hyperopia becomes absolute and impairs his vision for distance. It does not seem just that such an employee should be laid off, when, with the aid of glasses, he is better qualified than a new man without them. Certainly the personal equation should be considered. In deciding on what shall be done with such an employee, the chief surgeon or oculist should have the right to grant some leeway and retain such a one, though he fall somewhat short of the standard properly established for new men. There are serious objections to allowing an engineer or fireman to wear glasses for distant vision. The lenses become dusty, and in cold or stormy weather the moisture will accumulate and blur the vision. Should the glasses become misplaced, the employee may for the time be disqualified for service. Some companies grant old employees the privilege of wearing glasses, while others refuse to permit their use. Without the permission to wear them we must say to the faithful employee: "Thou art weighed in the balances and found wanting." Glasses should be permitted for near vision, with which No. 2 Jaeger type can be read at fourteen inches.

Shall re-examination be required? Most certainly! As it has been clearly demonstrated that the eyes do change, they should be re-examined at regular intervals of from two to four years, and always after an attack of serious illness or accident. The difficulty regarding glasses, which would ultimately be required, is sufficient reason for considering the refraction as well as the acuteness of vision of each new applicant for railway service. As a precautionary measure the pupilary reflexes and fields for form should be tested.

Dr. Williams of Boston, in his contribution on "Form and Color-Vision in Railway Service,"[1] has so clearly presented the subject of color perception and the tests to be made use of, that I here quote a part of his article, which I most heartily endorse: "The standard examination for color-vision should include three things: 1, a test with colored signal-flags; 2, a test by comparison of colors by the Holmgren worsteds; 3, a test with colored lights seen through openings of regulated size, which will form small images on the central part of the retina.

"The acuteness of color-vision varies considerably from the normal standard, as does form-vision. We may have a feeble color-perception, an incomplete loss of color sense, generally for red and green, or a complete loss of perception for one or both of these colors, and in rare cases a complete loss of all color-perception, in which the solar spectrum looks like a grey smear of varying shade, but no color. The object of our test is to discover the extent and character of the defects, and whether they are sufficient in amount to disqualify according to the standards adopted. The test with flags shows whether the man can give correct names to the flags, and can tell their use and meaning. It is also desirable to use one of the flags at a time as a test-object, and get the applicant to pick out from the heap of Holmgren's worsteds all the colors that look like the flag. It will often be found that the correct names can be given to the different flags even when the test by worsteds and colored lights shows a considerable defect of color-sense, but when used as a comparison test a green may be selected among the other colors as looking like a red flag, or vice versa. The second test, by comparison of colors without naming them, selecting from a large number those which appear to the applicant like certain test-skeins, light green or pink, according to the method proposed by Professor Holmgren, is the most satisfactory and easily applied of all the good qualitative tests, but it does not give a sufficient test for small central scotomata.

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[1] Trans. Am. Oph. Soc., vol. viii, part 1.

"I have recently had a conductor who passed both the Holmgren and the Thompson tests without making a single mistake, and who selected his colors without hesitation, but when examined by colored lights transmitted through small openings, or even with switch-light lenses, before a lamp at twenty feet distance, he called a red light 'white' in four different cases; he had a central defect in the retina, probably caused by the use of tobacco in excess, yet the area affected was so small that the retinal image of the flag or the skein of worsted was formed partly on the diseased retina and partly on the healthy portion outside the scotoma, where the color could be easily recognized, but when the retinal image was reduced in size, as with the lights, it was formed entirely within the borders of the scotoma, and red lights were called white or sometimes green. It will not do, however, to substitute the tests with such lights for the Holmgren tests, as the lights give little chance for comparison or for the selection of confusion colors, and for ordinary cases of congenital color defect it would take a long and tedious examination to reach the same result that could be arrived at more quickly by the worsted test. On the other hand, the test with lights, with regulated openings, should be used in addition to the worsted test, as was first proposed in Holland."

The test with transmitted lights may be made at twenty feet, or six meters, through an opening 2 mm. in diameter; through such an opening a person with normal vision and color perception will at once recognize the color. Dr. Williams' instruments for testing with colored lights is so constructed that the standard colors can be exposed through openings of sufficient sizes. By such an instrument the examiner is enabled to test the form-color-sense and detect any defect that may exist in the central portion of the retina.

In reference to the test "with Holmgren's worsteds it is possible to make a distinction between some of the greater variations in color sense, for if a person is hesitating, picks up some confusion colors and compares them with the test skein, perhaps selects them and then discards them, or picks up some of the true colors, and after comparison rejects them, finally selecting none of the confusion colors, it shows that he has a feeble color perception; if he selects with the green some of the confusion colors, but with the pink or rose skein makes no mistake, it shows he has an incomplete defect; but if with the green skein he selects confusion colors in addition to the greens, and with the rose skein selects with the rose colors some blues or violets, it shows he has complete defect for red, or if with the rose skein he selects in addition to rose colors some greens or grays it shows he has complete defect for green."

"The tests for both form and color-vision should be made when the man is not fatigued by a long tour of duty or exposure, for it has been found that the acuteness of both form and color-perception is often diminished after two hours or more of engine work. After long runs and unusual exposure this temporary reduction in acuteness may be considerable, and it furnishes an additional argument for insisting on a high standing for such service. If one-half of normal vision were to be accepted as a minimum for each eye when the person was rested and in good health, the conditions of service might easily reduce this far below the danger point, but if a high standard is required the vision may be temporarily reduced by fatigue without becoming dangerous."

In conclusion, I would emphasize the following points: 1. The adoption by railway companies of a uniformly high standard of vision for men entering their service. 2. Uniformity of tests with colored flags, yarns and lights. 3. The re-examination of employees at regular intervals and after serious illness or accident.

DISCUSSION.

Dr. John F. Fulton, St. Paul, Minn.—It has been my privilege to have had quite an extensive experience in the line of work suggested by Dr. Bane's paper, and in order to make a success of the practical rules for examining candidates for train service as to their condition as to acuteness of sight, acuteness of hearing and color sense it is necessary to have the officials of the road in sympathy with and interested in the work of their oculist. When this subject is first brought to the attention of the railroad officials, they are disposed to look on the work as of little importance, and will give it but indifferent attention, but if you can succeed in obtaining their presence at a few examinations of candidates who are seriously defective, they will at once see the importance of the work and will then be disposed to make the examinations more severe than necessity demands.

For a number of years I have been doing this class of work for two of our Pacific Coast lines, emanating from St. Paul and Minneapolis, and have been consulting oculist for a number of other roads; consequently during the last ten years there has been examined, under my direction, a large number of men in train service, probably twenty-five or thirty thousand. Judging from my own experience in this work I am disposed to look on the requirements as suggested by Dr. Bane as somewhat severe. If a man has vision of 20/20 in one eye and 20/40 in the other, I would have no hesitation in passing him, certainly if the slight defect in sight is due to a refractive error which can be completely or partially overcome by proper correction.

How often should each employee in train service be examined? This is a question well worth our careful attention. My own rule on the subject is as follows: All new candidates for train service should be examined before being employed, and re-examined whenever promotion takes place, or whenever they are transferred from one division to another, and all employees in train service should be examined every three years.

In regard to the examination for color sense, I do not know anything that requires more careful and conscientious work on the part of the oculist than those patients who at first hesitate as to matching of colors, it being often difficult to decide whether or not they are really color-blind, or "color ignorant" or " color stupid." It will be frequently found that such men, after repeated examinations, will demonstrate that their color sense is perfect and that they are perfectly safe men to be employed in train service.

The laity and many of the general practitioners look on color-blindness as a congenital and incurable defect. This is by no means always the case. Defects in color sense are frequently due to the excessive use of stimulants, such as tobacco and alcohol, and in the early stages thus acquired the trouble is completely curable by removing the cause; hence the importance of making frequent examinations.

What shall we do with old and trustworthy employees in train service, who have lost one eye while in the employ of the company and have perfect sight in the remaining one? We will all admit that it is not perfectly safe to retain such men, yet it seems like a great hardship to dismiss them on account of an accident which has occurred, while they are rendering faithful service to their employers. This is a matter more for the officials of the road to deal with than for the company's oculist. One of the most serious accidents with which I am familiar was unquestionably due to the defects of a one-eyed engineer. As you know, in all one-eyed men the range of the field of vision is not as large as with both eyes, and in the case alluded to there was an obstruction on the track on a sharp curve, which he failed to see, resulting in a most serious accident, costing a number of passengers their lives and causing the destruction of a large amount of property.

Equally as important as the testing of the eye-sight in railroad employees is testing the acuteness of hearing. General surgeons and inexperienced oculists who first begin the work are apt to depend too much on the tick of the watch as a test, but experience will soon teach them that it should only be utilized when making the preliminary examination. If at this examination the candidate can not hear the watch tick beyond six inches, he should be referred to an experienced aurist, and if he finds no progressive disease of the ears, and that the candidate's acuteness of hearing is normal for whispered and spoken speech, he should have no hesitation whatever in passing him for train service. I am familiar with the requirements of one road in this department where the surgeon required that the watch should always be heard at eighteen inches. It happens to be a small road, so fortunately no great harm was done. Should this rule be enforced on a large one, where they employ seven or eight thousand men in train service, it would mean the dismissal of from five to eight hundred of their best ones. In cases where we are in doubt as to the progressive nature of the trouble, a certificate should be given, limited for one year.

The work of the oculist for the railroad company should be divorced as much as possible from the work of the chief surgeon, because it will always happen that, if the chief surgeon attempts to interfere with the oculist in his work, he will so cripple him that he will not be able to get results satisfactory to the candidates, to the road or to himself. I have been particularly fortunate in my own association with the chief surgeons of the different roads for which I work, as they have not shown any disposition to interfere but, on the other hand, have given their best assistance to make the work a perfect success.

Dr. J. T. Eskridge, Denver, Colo.—I would raise a medicolegal question in this connection. I think the chief surgeons and managers of railroads are the responsible parties in this matter. This question suggests itself: When a man is reexamined and color perception is less than that of other employees newly accepted, what responsibility would the railroad have to bear if a person should be injured because of the defective vision of an old employee. It seems to me that if it were shown that the old employee did not have perception sufficient to prevent an accident from occurring, the railroad would be responsible, and the chief surgeon, who is mainly concerned in their cases, should co-operate with the oculist and inform the managers of the road when the vision of the old employee is becoming defective.

Dr. T. B. Lacey, Council Bluffs, Iowa—There was one feature brought out by Dr. Bane, in his paper, which is worthy of further discussion, viz.: that in the examination of applicants for positions, or old applicants, we ought to have their records as to their condition when they are examined. He referred to the fact that a man in doing certain work has deterioration of vision due to the energy he has expended, and there is considerable truth in that. I have examined railroad employees who have been instructed to come to me for that purpose, and when they came they were in no condition to pass the proper examination, because they had been overworked. These men had not received any treatment. They had not received the consideration that they ought to receive, and still there are times when I do not know how that is avoidable, because they do not feel disposed to lay off from a trip or from their work a day or two to get thoroughly rested; but still, in a great many cases the evident weakness of vision or defect in color perception is largely due to overstrain or overwork, and they are not in proper condition to undergo a satisfactory examination. We all meet with cases of defective color perception in employees to be examined or re-examined, but much of it is due not so much to direct weakness as it is to absolute ignorance of what colors are; I have had applicants come to my office, off and on, and have asked them the color of a certain skein, and they will determine the color correctly at once, and then when they are asked to match or take all the skeins that contain that color, they will immediately go to work and try to match it with another shade. It is a difficult matter to so word our instructions to men who are wanting employment, that they will distinctly understand what we want them to do. If you give them the standard for the simplest green skein, and tell them you want the skeins that contain the green color, they will immediately pick out the shades which most nearly match the sample; you want the dark as well as the light.

While a great many employees whom we examine develop a weak color perception, a good many others are simply color ignorant."

Dr. John E. Owens, Chicago—I have been engaged in examining applicants for railroad service for a long time, and I still find some problems very difficult to solve satisfactorily. Not long since, I left Chicago at 6:30 in the evening, and returned the next morning at 8:30, having traveled 794 miles and remained 3½ hours in the town I visited. I say this to emphasize the importance of having men on our trains with normal color vision, on account of the great rapidity with which our trains run at the end of the nineteenth century. A mile a minute is common on many of our first-class railroads, not for the whole distance, but for many miles, and there has been such an advancement made in speed of trains, in equipment, in coaches, in trucks, and everything that pertains to the running of a train, that we certainly are beginning to see more and more the necessity of having men with normal physical endowments, normal functions, and particularly normal color sense to act as engineers. We have had a uniform system for some years on the Illinois Central, and the same system is in operation on the Northwestern. We go much further than examinations for visual defects and hearing. Physical aberrations which impair usefulness, which lengthen the time of disability or which lessen the powers of endurance of the physical strain during the running of fast trains are considered. I find a problem something like this to deal with: A new man reports for examination. He makes the characteristic mistakes of the color-blind and is rejected. He comes again for re-examination, and is again rejected, and even a third time. I have been inclined to be liberal with the men in examining them several times, seven or eight days apart, to show them that I am disposed to do everything for them that is reasonable and right. A man with defective color sense will pick up the wrong skeins or point out the wrong colors. Others, after repeated examination and more or less outside practice, can key themselves up to pulling through, and the question arises: are we justified, under the circumstances, in passing them, or should they be rejected as the result of original characteristic errors? The latter is the course to be adopted.

When I first began to make examinations of employees on the Illinois Central, the Holmgren worsteds were used, and I was instructed by the general superintendent, as this was a new matter, to go over the road again and re-examine them. With assistance I accomplished it and examined the employees with flags and lanterns. I was a little timid about that part of it. I had every confidence in the Holmgren test for the detection of color sense, but I did not know what the men would do with flags and lanterns. I thought the Holmgren test would catch all, but I feared the other tests might let some slip through. We used flags in the day time and lanterns at night, and I was very much surprised to note the numerous mistakes that were made in naming the flags and lantern colors amongst those who had previously been found defective by the worsteds. The late Dr. Robert Tilley devised a little instrument which he used on a patient who was referred to an oculist, where he had examined the man and found him defective. This instrument was intended to bring out the personal equation in connection with such examinations. We did not bring it out to perfection. It was a domestic affair, but it corroborated the results of our previous examinations of certain men who were found defective in color sense.

Dr. A. I. Bouffleur, Chicago—The old statement that "a chain is no stronger than its weakest link" should be applied in examining men when tired. If a man is color-blind or color defective when he is tired, just after he has quit work, is he a safe man in a responsible position ten minutes before he has quit work? If we are to have perfect men on our railroads, it is best to test them when they are tired. I have to examine railroad employees in Chicago who run their trains by signals from the time they go out until they go off duty, and it is very essential that those men should be perfect in color sense at the close of their day's work, as it is at the commencement of it. I therefore take exception to that part of the Doctor's paper.

Dr. J. T. Eskridge, Denver, Colo.—I showed, in my paper, that hysteric subjects and neurasthenics commonly have limited fields of vision. I know not why it is, but in Colorado, particularly among railroad employees, neurasthenia is exceedingly common. I have examined eight or ten neurasthenics from the D. & R. G. Railroad this year, in whom the fields of vision were at first narrowed. It is evident that such men would not make good signal-men. I would like to ask the Fellows of the Academy if they have made any distinction in examining the eyes of railway employees, whether the patients were either "run down," neurasthenic, or hysteric? Those with manifestations of hysteria showed a decidedly contracted visual field.

Dr. W. C. Bane, closing the discussion—As to the point brought out by Dr. Fulton, I agree with him that a man with one eye is disqualified for engine service, and unsafe for signal service. An old employee should be given other work.

As to the question raised by Dr. Eskridge in regard to neurasthenia and hysteria, I can only answer that in physical examination, the Rock Island surgeons include diseases of the Spine. The fields of vision are taken in the eye examinations.

The point with reference to men being tired at the time of examination should be carefully considered. A man at the end of his day's work ought to be able to recognize colors and see the signals quickly enough to protect himself and the passengers. The man who does not recognize colors promptly should not be employed for service where it is necessary to give and receive signals. Such men should be rejected.

I rode with an engineer on the Rock Island for a short distance in coming east, there being an electric headlight on the engine. He stated that for white and red the electric light was far superior to the ordinary light used on the engine, but he thought it was no improvement for green. I was impressed with the thought that the green lights as used on the railroads are not large enough

CRANIECTOMY FOR EPILEPTIFORM SEIZURES AND GRAVE MENTAL DISTURBANCES FOLLOWING HEAD INJURY WITHOUT APPARENT FRACTURE. WITH REPORT OF A CASE.

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The following case is reported, partly because it is somewhat unique in the pronounced character of its symptoms, the absence of demonstrable organic lesion, and the promptness and completeness of relief following operative treatment; partly because it illustrates, better perhaps than any description I could give, a rare but important group of morbid phenomena following injury to the cranium; but chiefly for the purpose and with the desire of calling forth an expression of the views and experience of the Fellows of the Academy in regard to this interesting class of head injuries.

C. M., aged 20 years, American, wood carver, single, gave a family history negative as regards any neurotic or other hereditary tendencies. He was well-nourished, not addicted to the use of tobacco or spirituous beverages, had never been sick, never showed any tendency to nervousness, had had no occasion for worry, no overwork, no mental excitement, and up to the time of injury was of a lively and contented disposition. His sexual organs showed nothing abnormal, and he denied a history of masturbation or of seminal losses.

On Monday, March 6, 1899, in jumping from a slowly-moving passenger train, he was thrown violently to the ground and partly stunned. According to his own statement, he braced himself on his hands and in raising his head, was struck over the left parietal bone by the sharp corner of an oil-box. He soon recovered from the immediate effects of the fall and blow and went at once to his work. A small scalp wound over the left parietal region healed rapidly and without surgical attendance. For the next twelve days he continued at work, but found himself troubled with headache, soon associated with dizziness. Work became very fatiguing and was no longer enjoyed. His appetite failed and loss of weight was noticeable. Mentally he became somewhat dejected and irritable. These symptoms became gradually more pronounced, so that on the twelfth day after the injury he was obliged to quit his work.

On the following day, without premonitory symptoms other than those just mentioned, he was suddenly seized with violent muscular spasms, affecting, so far as could be learned, the entire system, and resembling an epileptic convulsion. He was thrown to the ground, remained seemingly unconscious for a few moments, then began rushing about, striking at whatever came in his way, throwing his hand to the left side of his head and crying: "You shot me." The mental excitement lasted for over an hour, when, for the first time since the injury, he was seen by a physician, Dr. Nutt, of Plymouth, Wis., who subdued him temporarily with hypodermic injections of morphin. The following morning he appeared perfectly well, but during the day the phenomena of the previous day were repeated. The muscular spasm was partly tonic, partly clonic in character, the former predominating, and it was noticed that the rigidity was such as to interfere with respiration to such a degree that asphyxiation seemed imminent, when suddenly the spasms would relax and respiration again become regular. At no time was any frothing at the mouth or injury of the tongue noticed Unconsciousness, though at times complete, was of rather short duration for a true epileptic attack, and soon gave way to the wild delirium mentioned. To control him at such times required the services of two or three strong attendants. The muscular movements did not have the rapid, jerking character usually observed in true epilepsy; they were irregular, the motions of the extremities extensive in range, often giving the impression of being semivoluntary.

The attacks now came on daily, with increasing severity and duration, attack often following attack for hours, with but short intermissions. Their general character remained the same. The accompanying mental disturbances were of variable duration, at times subsiding with the muscular spasm, at others lasting for hours afterward. These attacks occurred daily for a period of over six weeks, and in spite of various lines of treatment, including change of surroundings, kept increasing, both as to severity and duration. Meanwhile the attending physicians made the observation that the spasms could be brought on by pressure on a small area, about one-half inch in diameter, located over the left fissure of Rolando, 1½ to 2 inches from the vertex and an equal distance above the scar of the scalp wound.

This area, corresponding to the location of the right arm center, was very sensitive to pressure, and when pressed upon the patient would sink to the ground and immediately go into one of his attacks. At the same time it was noticed that the muscular twitchings always began in the right hand, proceeding thence to the arm, trunk and other extremities. The correspondence between the initial periphereal disturbance and the apparent point of central irritation was therefore a very accurate one.

During my first visit to the patient, April 28, nearly eight weeks after the injury, I was enabled to observe and verify all the conditions just described. Aside from these disturbances there were no abnormalities of either motor, sensory or mental character; the ocular muscles and pupils acted normally; the patellar reflex was, if anything, slightly exaggerated, the functions of the bowel and bladder were normal. All evidence of fracture or depression of the cranial wall was wanting. A small scar was found over the lower portion of the left fissure of Rolando, about 3½ inches below the vertex.

Taking into consideration the history and symptoms as just described, the presence of a gross irritating lesion acting on the left cerebral hemisphere in the region of the right arm center appeared extremely probable. Operative treatment was accordingly advised and received the ready assent of the patient and his family. These were fully advised of the uncertainties both of the pathologic diagnosis and of the effects of the operation proposed, but were willing to take almost any risk, so appalling had the patient's condition become.

The operation was performed April 29, 1899, with the assistance of Drs. Nutt and Felter of Plymouth. Owing to the very pronounced focal indications, it was decided to ignore the scar and open the skull directly over the hand and arm center, corresponding to the sensitive area before described and to enlarge the opening in the direction of the scar, or make a second opening at this point, if indicated. A skin and bone flap, about 1½ inches in diameter, with the base downward, was formed, its upper portion corresponding to the sensitive area mentioned, while its lower border extended to within about three-fourths of an inch of the scar. The bone was divided chiefly by means of chisel and rawhide mallet. Not the slightest injury was inflicted on the dura, except in the upper anterior angle of the wound, where a large vein was sufficiently opened to give rise to a rapid and extremely troublesome hemorrhage. This was controlled by gauze pressure, as ligation proved impossible without considerably enlarging the opening in the bone. On raising the bone flap, the underlying dura appeared perfectly normal; there was no evidence of old or recent injury, no bulging, no evidence of fracture or depression either at the seat of injury or in its vicinity so far as it could be explored. As the locality of the scar could be quite thoroughly examined through this opening it was decided to make no further one at this time, but to await the result of this operation and meet future indications as they might present themselves. The wound was accordingly dressed, the flap having been replaced, and the patient put to bed with head and shoulders well elevated.

The subsequent course of the case was uneventful. No further hemorrhage followed. On the third day there was a sharp rise in temperature, which promptly subsided on removal of the packing and remained normal thereafter, while the wound healed readily.

From the moment of the operation there was no return of any of the disturbances described, and the young man has to all appearances been perfectly well since. He returned to work after a few weeks, and at this writing, over five months after the operation, is doing full work as laborer in a chair factory.

In the study of this case, the question which most strongly presents itself is that concerning the pathologic condition which brought on the grave disturbances noted; in other words: What was the true nature of the trouble, and what the *modus operandi* by which the apparent good effects of the operative procedure were brought about?

Malingering could be safely excluded, as neither the patient nor his relatives blamed anyone but himself, so that there could be no motive for feigning the symptoms. While in some respects the symptoms reminded one of hysteric manifestations, yet their exact anatomic grouping, together with the history of the case, seemed to preclude this diagnosis. The character of the muscular spasms did not correspond to that of ordinary epilepsy, neither would the history admit of this view.

I am inclined to look on the case as one of cortical irritation due to a mild or subacute inflammatory process, set up at the seat of injury, either from the direct effects of the blow, or from infection through the scalp wound. A pathologic condition of this nature would be likely to be benefited by the relief to the circulation and other local changes incident to the operation.

Whatever interpretation we may give, the case furnishes an interesting illustration of what violent disturbances may follow on comparatively slight traumatisms of the head, or arise from pathologic conditions so difficult of detection as to escape the surgeon's notice. The evident curative effect of the operative interference will admit of several interpretations, according to the view we take of the pathology of the case.

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DISCUSSION.

Dr. J. T. Eskridge, Denver, Colo.—Did you say, Doctor, that a single convulsion would last an hour, and the attacks would repeat themselves?

Dr. Reineking—The convulsions did not last for more than three to five minutes at a time; there was no rise of temperature noticed.

Dr. Eskridge—Some of you may remember that during the War of the Rebellion, Drs. W. W. Keen, S. Weir Mitchell and Dr. Morehouse had charge of the hospital, in Philadelphia, for all of the wounded soldiers. These practitioners took a deep interest in surgical pathology and neurology at that time. The report of their observations was made in 1864, and appeared in the October number of the *American Journal of the Medical Sciences*, for 1864 or 1865. Mitchell reached the conclusion that a convulsion which lasted for more than two minutes, as a rule, was not a genuine epileptic convulsion: that a person might voluntarily so exert himself as to cause the pupils to dilate, as in genuine epilepsy, yet the convulsion be slight. The mere fact that repeated convulsions occurred for an hour or more, without loss of consciousness, and without a rise of temperature, would exclude the possibility of true epilepsy.

I can not agree with the essayist that there are no evidences of hysteria. We must remember that in hysteria there is some starting-point, and in traumatic hysteria the symptoms begin at the point of injury. This man was evidently injured; whether there was any congestion of the brain or not, the local injury would have been sufficient along with the disturbance of brain cells to determine the point of the attack. We do have symptoms in traumatic troubles where there is depression of bone. The convulsions when the depression is over a so-called motor region continue for some time, but rarely is there a convulsion without rise of temperature if the fits, Jacksonian in character, are frequently repeated. The Doctor's case was undoubtedly one of pure hysteric epilepsy due to traumatism, and I heartily indorse the treatment he pursued.

Dr. H. Reineking, closing the discussion—I have not given the subject of hysteria that thorough study which my friend

Dr. Eskridge has. What led me to exclude this was chiefly the close correspondence of the symptoms to the lesions and I was under the impression that in hysteria we do not get the exact grouping, or correspondence between the injury and the symptoms, such as we had in the case reported.

SOME POINTS IN TREATMENT OF SEVERE CRUSH INJURIES OF EXTREMITIES.

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In almost twenty years of observation, but more especially as attending surgeon to a large general hospital, which experience has been supplemented by a considerable experience in railroad injuries also, the writer has been particularly impressed with the urgent need of a better knowledge and comprehension, by the general profession, the general surgeon, and even the railroad surgeon, of the character of severe crush injuries of the extremities, the prerequisite to the proper insight to treatment. It has been a too frequent experience to witness the loss of limbs, and even loss of lives, from surgical treatment so much worse than useless as to be pernicious, and which displayed an amount of ignorance on the part of the practitioner which might be considered criminal, were the efforts not clothed with good intentions. It has been a too frequent observation that surgeons seemed to lack a proper knowledge of the surgical principles involved, and also that even railroad surgeons fall short of the best results.

The general practitioner fails from a lack of the application of surgical principles, contained in all our textbooks on surgery, though perhaps not sufficiently well formulated, nor definite enough in their application to special cases. The general surgeon may fall short of expectations because lacking a large observation of these special cases, so necessary to the highest success in any special field, more especially this one. The railroad surgeon will probably not be lacking in surgical principles, and his experience may be well rounded, but he may fail of the very best results, by not possessing the inspiration which will carry his practice beyond the ordinary or routine.

The writer claims nothing new, nor original, in any ideas which he may present here, but he desires to emphasize what appears to be a general need for a more universal application of the principles of drainage in a class of cases in which it is most urgently needed, if the greatest good is to be secured.

So large a proportion of railroad injuries come within the scope of this article, and the results of treatment are so important to all concerned, that it would seem desirable to promote discussion, and disseminate our conclusions that improvement in treatment may be secured tc the unfortunate.

Severe crush injuries are necessarily contused, lacerated wounds of a class that involves extensive destruction of cellular tissue, with portions perhaps destroyed in mass, conditions favorable to sepsis, with an enormous amount of dead tissue and wound fluids producing tension, with its attendant inflammation—a natural hotbed for bacterial development. Such conditions necessarily require a full comprehension of the principles of drainage, which I have sometimes thought was becoming one of the lost arts in surgical practice, being actually ignored because of the insane desire to carry out what is erroneously conceived to be the principles of antiseptic surgery; in reality, drainage is one of its most useful handmaids.

It has been the observation of every railroad surgeon, that it is quite impossible to form a correct estimate of the amount of destruction suffered by the tissues, in a subcutaneous railroad crush, or the amount of damage done to tissues near to, or even remote from, a severe injury of this class. The writer therefore deprecates the too common tendency to so-called conservatism in these cases, by the watching and waiting course, which surely brings the necessity for surgical intervention for the production of drainage, necessitated by the onset of sepsis, which surgical intervention, if performed at the outset, might have averted the sepsis, with all of its possible attendant consequences; among which may be mentioned the various infections, septic lymphangitis, thrombophlebitis, gangrene, spreading gangrene, and the general dangers to the patient of septicemia and pyemia. The dangers from pent-up wound fluids and necrotic tissue are greater than the possible harm from incisions intelligently made, or from any danger from infection through such wounds, the compensating advantages being infinitely greater than their possible disadvantages. Indeed, these incisions often reveal the necessity for drainage, which might otherwise be overlooked. Insufficient surgical intervention may subsequently call for interference out of all proportion to the most radical initial requirements.

Contused tissues are always subjected to a severe tax on their vitality, by an impaired venous return. The force of the arterial current is usually less at fault. It is this condition of the circulation which accounts for the great tendency to the extravasation of blood and serum, so favorable to the production of swelling and tension, which still further adds to the embarrassment of the venules. It has probably been the observation of every surgeon, that multiple incisions in skin flaps of doubtful vitality will often preserve their integrity. This is accomplished by the application of this principle, in relieving the burden of the return circulation. An extended application of this resource, in the treatment of considerable masses of contused tissues, as found in a crushed member, is often equally magical in its benefits. I therefore maintain that its intelligent application will accomplish results impossible of attainment by any other method, in the treatment of tissues not actually deprived of vitality. It will therefore be seen that the application of this principle will necessitate an apparently radical treatment, of seeming unnecessary severity, at the outset, which will in reality relieve the engorged tissues of their burden of dead cells and waste products, and safeguard the living cells from bacterial attack; also furnish avenues of escape for necrotic masses of tissue, relieve pain, and save the patient the dangers attendant on swelling, sepsis, and inflammation, and its necessary consequences. My plea, therefore, is for drainage sufficient to relieve the wound spaces, otherwise liable to extravasation fluids, and the living tissue cells from undue embarrassment.

To these principles of treatment must be added the application of the best surgical methods for carrying off and maintaining the wound products aseptic. This may be accomplished by an abundant hygroscopic dressing, though in the more severe cases the moist antiseptic dressing is more efficient. But in the worst of cases, continuous submersion, or continuous, through-and-through irrigation with an efficient antiseptic is required to accomplish what is demanded in desperate cases, which are usually already very septic.

A considerable experience has found formalin so valuable in clearing up septic conditions of the more malignant type, that it has led the writer to believe that we have in this agent a most powerful antiseptic, destined to a place of first rank, in the treatment of all septic conditions. While the writer believes that the devitalized masses of tissue should be removed at once, or at a comparatively early period, yet he believes that in the use of formalin we have an agent which will maintain dead tissue free from germinal invasion, and innocuous to the living tissues, and is itself incapable of exerting a very devitalizing influence on the living cells if used in proper strength. This enables the surgeon to conserve tissues otherwise destined to destruction, and at the same time not be an element of danger.

The principles herein set forth have been largely followed in the cases reported by the writer, under the titles "Conservative Foot Amputations," before the Omaha Medical Society, in November 1897; "Amputations," before the Western Surgical and Gynecological Association, in December of the same year; and "Skin Grafting in the Absence of Amputation Flaps," before the Nebraska State Medical Society, at its meeting in 1895.

This paper has left untouched many points in connection with this subject. A treatise was not intended. The emphasis of a few essentials, so regarded, is all that has been attempted. And though the writer's recommendations should not be indorsed by some, this much will be granted, that the following of these lines of treatment would certainly be an improvement on the results obtained from the practice of those who are possessed of a penchant for sewing up severe, contused, lacerated, even mangled members, and the failure to establish adequate early drainage—the too common practice of the average practitioner and a fault from which the general surgeon and some railroad surgeons are not altogether free.

DISCUSSION.

Dr. W. Ruml, Cedar Rapids, Iowa—I desire to say a word or two in reference to the use of formalin, in connection with the paper of Dr. Lord. I have been using moist formalin dressings for some time, and so far they have proved eminently satisfactory. I use ⅛ per cent. solution of formalin for saturating sterilized gauze, and the gauze is applied moist. In this way drainage is favored, and the oozing from the wound cared for by the dressing and does not macerate the wound area.

Dr. Eduard Boeckmann, St. Paul, Minn.—I was very favorably impressed with the remarks of Dr. Lord in reference to drainage. I have tried to do ideal surgery without resorting to drainage, but the older I grow the more I come back to treatment of wounds with it. As regards formalin, I have had no surgical experience with it. I have always considered it a good antiseptic, just as efficient as any other material for this purpose, but I do think its germicidal properties have been greatly overestimated. Formalin has been recently recommended for the purpose of preparing the skin, and in the opinion of prominent surgeons it is the best antiseptic we have for disinfection of the site of operation, and I should not wonder if formalin, used as a dressing, will prove as efficient as many other agents we now use. I rather believe it is a good remedy for dressing wounds, and will certainly try it when opportunity presents itself.

Dr. J. P. Lord, closing the discussion—If I can see a case of railroad injury in its incipiency, or very soon after its occurrence, I do not believe the use of formalin either for the purpose of submersion or irrigation of the part is necessary. Thorough drainage with sterilized water may prove sufficient; but in cases where the wound is already foul, we have a valuable agent in formalin. Bichlorid of mercury, which was formerly so much used, I do not usually apply as a moist dressing, because there is considerable albuminous secretion which soon forms the albuminate of mercury, and this is inert as an antiseptic. In such cases I am a friend of carbolic acid, unless there is too great danger from absorption. My experience with formalin dates about two years, during which time I have used it extensively in clearing up unclean wounds of various kinds, and particularly necrotic ones, and where a limited space is to be covered I use it as strong as 2 per cent. of the forty volume solution, but that would make it much less than its percentage would indicate. I have found that even one-half of 1 per cent. was sufficient to devitalize granulations during that period of progress of the wound when granulations were so desirable. It exerts a much more powerful influence on the tissues than our first experiences led us to believe. I have seen granulations destroyed repeatedly by the application of 1 or 2 per cent., used for two or three hours. I have seen granulations destroyed by washing the part with a 2 or 4 per cent. solution. In a day or two thereafter I have seen a tanned necrotic layer appear on the surface, which must slough off before further progress can be made. The remedy should be used with considerable caution and in very weak solutions; ⅛ of 1 per cent. is the usual strength now used by me.

I recently had a case in which there was a most intense form of infection following a railroad injury, it being necessary for me to extend the palmar incision up through the palmar fascia, to open the sheath of the flexors clear to the elbow. The septic condition extended almost to the axilla, and it was evident that the patient would succumb if relief was not afforded, consequently the whole palmar surface of the man's hand, wrist and arm was laid open; the diseased tendons were cut away, and the wounds were packed with formalin as a dressing, shortly after which there was a very material reduction in the temperature of the patient, and it was really remarkable to see what formalin did in this particular case. Formalin was usd as often as it was deemed necessary. Here is one case of infection where formalin acted in a marvelous manner.

ANESTHESIA.

BY R. H. COWAN, M.D.

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If an apology for venturing on this much debated ground seem proper, let me remind you that it still remains *debatable*. Admitting the value of recent experimentation, of papers that have been written, and the discussion which they have evoked, I fail, however, to note any decided influence on the profession at large, as evidenced by a change in the choice of an anesthetic. In certain parts of this country, we find ether the anesthetic par excellence, while in others, chloroform is used almost exclusively. In view of this singular difference of opinion, the following statistics from H. Bellamy Gordon are of interest: Chloroform, one death in 3121; ether, one death in 15,587.

Apropos of the above, the *Medical Standard* asks: "If statistics are reliable, and if we are to continue to draw our deductions from them, are we to favor the selection of chloroform." But against Gordon's figures, we must array Dr. Hunter McGuire's report of 27,000 administrations of chloroform, during the Civil War, without a death. Admitting the correctness of the above figures, we must confess that statistics have so far failed to solve this important problem. Let us see what we can learn from study of the physiologic action of the two agents; and for this purpose we are necessarily limited to a brief review of some experimental work.

In the *Therapeütic Gazette,* April, 1898, I find the following résumé of a paper published by Hill in the *Journal of Physiology* for May, 1897. He pointed out that the circulation of the blood depends on the vasomotor mechanism being intact. The abdominal wall is able to support the veins, and to prevent their distension under the hydrostatic pressure of gravity. Muscular contraction during expiration compresses the hepatic and other veins, helping to fill the right heart. When the vasomotor tonus is maintained, the splanchnic area abrogates the effects of gravity. In vasomotor paralysis, gravity at once causes accumulation of blood in the abdominal vessels, and this leads to anemia of the brain, and the respiratory center is driven to greater activity, Powerful muscular movements take place and blood again enters the right heart. Contraction of the abdominal muscles limits the outflow from the abdominal vessels, and when both the vasomotor tonus and the respiratory pump are paralyzed, the circulation can not be maintained in the feet-down position. Chloroform paralyzes both these factors.

Hare says that chloroform kills by vasomotor paralysis; while Wood and Carter claim that chloroform narcosis is more due to drug effect; Waller, in a series of experiments on detached nerve tissue, found that chloroform causes more prolonged suppression of excitability than ether and that the suppression is finally absolute; i. e., fatal.

In regard to the action of these drugs, on the epithelium of the respiratory tract and kidneys, a résumé of views of various authorities whom I have consulted would simply consist of an array of diametrically opposite conclusions. That recent contributions to this branch of the subject have, at least, taught us much as to proper administrations, is undeniable; but turning to the clinical aspect of the case, we are again perplexed by the widely different conclusions arrived at by different authorities. Hare says that in equal proportion chloroform is far more likely to induce renal hyperemia than is ether, but it must be remembered, however, that a much smaller quantity of chloroform is necessary. Hunt of London, while advocating ether for general use, concedes the greater safety in the use of chloroform in bronchial or pulmonary diseases. Among the contra-indications to the use of ether, Hammond, of Philadelphia, includes valvular lesions, and fatty heart. Unger says that chloroform produces fatty degeneration of the heart and other striated muscular tissues. Dr. Lyman, of Chicago, claims that the stimulating effect of ether renders it safe in many cases of cardiac trouble. Lyman says that the use of chloroform is indicated in young children whose narrow air-passages may become clogged with mucuc, and I think the consensus of opinion confirms this, but regarding its use in childbirth authorities differ. Doenkoff has proved that ordinary narcosis in nowise lessens uterine contraction; however it is needless to observe that deep chloroformization is unnecessary here. In an able paper in the *Therapeutic Gazette,* Dr. Frank C. Hammond, of Philadelphia, after enumerating the contraindications to the use of ether, says of chloroform: "Practically, there are no contraindications," and again, "Chloroform is an ideal anesthetic, and if properly administered and carefully watched, the major ity of the untoward symptoms, so often referred to it, will be diminished."

This résumé of the merits and demerits of the two most commonly used anesthetics has, necessarily been brief, but it will, I think, suffice for our purpose, which is to show that deductions based on clinical evidence are as widely apart as the difference in statistics. How one totally unacquainted with anesthetics would reconcile these differences and at what conclusions he would arrive, after having consulted tables of statistics, and perused a number of authors, I am curious to know. Following the dictum of my own experience, I might write a symposium on the excellence and safety of chloroform as the anesthetic with which I am the more familiar, with the effect of convincing those of you who are already prejudiced in its favor; and with the opposite effect on those opposed to its use. I shall not do this, but I would like to invite your attention to a few facts which may in some measure serve to explain why statistics and authorities differ.

First, as to statistics: Chloroform, given by one inexperienced in its use, is a dangerous agent; and this is equally true of ether, but I think I am safe in asserting that the large number of surgeons who habitually give chloroform seldom resort to ether. The reverse is the case with those who give ether, and, it must be remembered, they are largely in the majority, hence, chloroform is much oftener given by inexperienced administrators, with the result of swelling the figures against chloroform. Now, as to differences of opinion, based on clinical experience: since I have indicated my own opinions, I can best explain them while attempting their defense, and to this end I desire to invite your attention to the following, which I quote from L. Fuster, in a recent French journal. "There are some points at first too easily established: That ether will produce a more rapid insensibility than will chloroform, that vomiting after operations is exceptional, that primary syncope is hardly ever seen, that secondary syncope presents the favorable (?) characteristic of showing an arrest of respiration, that only in the third stage is syncope more frequent. "All this," says Fuster, "has been repeated by numerous authors, but because a fact has been often repeated it does not follow that it be always true. Ether does not produce anesthesia more rapidly than does chloroform, when we know how to administer the latter —2 to 3 drops every half minute." Fuster further claims, "It is not clearly established that syncope does not obtain in the first stage when ether is used. The condition of the patient; his psychic temperament, and the manner of commencing the use of the agent are essential factors in its production." That syncope in the third stage is more frequent with ether, is, he says, due to the cumulative action of ether, producing a kind of intoxication; and another reason, I think, why writers differ. as to the relative safety of these two agents, is that this cumulative action of ether is forgotten. Is it not possible also, nay, probable, that, were all the deaths from so-called "post-operative shock" traced to their real cause, that cause would in many cases be found in ether; and not only these deaths, but those occurring later from renal and bronchial complications, which are ofttimes clearly attributable to ether, might further swell the list? It is, I believe, generally conceded as a fact that chloroform is much more rapidly eliminated than ether; and that the amount required for anesthesia is much smaller. On proper dosage and the manner of its administration depends the safety of chloroform. The experienced chloroformist has long recognized the importance of a free admixture of air with the anesthetic; he watches the respiration rather than the pulse, and withdraws the anesthetic during a deep inspiration lest the patient receive an overdose. In a recent paper communicated to the Society of Anesthetists, and published in the *British Medical Journal,* for April 23, 1898, Waller, as a result of his experiments, on nervous tissues subjected to the vapors of various drugs, arrives at certain conclusions which must have an important practical application. "Quantity," he claims, "is the all-important factor in chloroform anesthesia. Within certain limits it is a safe and reliable agent, but pushed beyond these limits it is unsafe." He defines the limits; in his experiments on nervous tissues, subjected to chloroform vapor and air, in mixtures from 1 to 10 per cent., the following facts were demonstrated:

Chloroform at 1 per cent. is excitant; at 2, 3 and 4 per cent. the anesthetic effect is more and more pronounced in proportion to the dose; at 5 per cent. there is a well-marked anesthetic effect, and not quite perfect recovery; at a little more than 5 per cent. the recovery is slight and imperfect; at 10 per cent. there is no recovery, the nerve dying rapidly. It has been claimed that there must be obvious differences between the behavior of the detached nerve, and the nervous system as a whole, and for this reason some may be disposed to question the practical value of Waller's experiments. His conclusions, however, are so entirely in accordance with a clinical experience that has convinced so many surgeons that chloroform, largely diluted with air, is a safe anesthetic, that their correctness must be admitted. It is worthy of note, too, that Snow held that chloroform should be used in a strength of 5 per cent.—this being Waller's limit. Dubois and Bert, in France, have formulated similar rules based on their investigations. It is probable that the safe limit would be between 1 and 4 per cent.—certainly *not* beyond 5 per cent.

That strong arguments may be adduced for and against both of these anesthetics is true; that few surgeons regard either of these agents as quite up to the standard of an ideal anesthetic is evidenced by the number of mixtures that have been, from time to time, tried. In this connection, Schleich's method, as one of the most recent, and probably the most valuable contribution to this important subject, is worthy of notice. His experiments were based on the theory that the ideal anesthetic should have a boiling-point as near the temperature of the body as possible, and he prepared three formulæ of agents which most nearly meet that requirement, the drugs selected being chloroform, ether, and petroleum ether; and Dr. Willy Meyer of New York bears testimony to the value of it. Considering local anesthesia, or analgesia, as railway surgeons, you all know what shock means; I do not say you all know what it is, for I am not sure that any one does. The question of operation under shock has been argued time and again, and I have listened to both sides, but in regard to it, am in the state of mind we all are. As to anesthetics, I have my own convictions, and am afraid of the added shock of pulmonary anesthesia. I know there are those who differ from me; who believe that ether and chloroform are stimulants, and who do not hesitate to anesthetize and operate at once, but I have not the temerity to follow them, and for this reason I decided some years ago to try the local injection of cocain in such cases. My first major operation, an amputation of the leg, was done in 1891, and since that time I have performed twelve major amputations, including three of the thigh, and have removed a large, deeply imbedded tumor—adipose—from the popliteal region, and have done a large number of operations of lesser magnitude, employing in these cases, cocain analgesia, and in every instance with most gratifying results. I am not unmindful of the danger of this drug, but I believe that its sphere of usefulness is much wider than is generally supposed, and I am sure that used with proper caution it will, in selected cases, prove safer than any pulmonary anesthetic. Dr. Thos. H. Manley, in his very excellent work on cocain, has given us some most valuable suggestions as to its use.

328 West Forty-second Street.

DILATATION OF OPHTHALMIC VEIN: CURE.

BY R. ORTEGA, M.D.
Chief Surgeon Mexican International Railway.
CD. PORIFIRIO DIAZ, COAHUILA, MEXICO.

I will give a brief résumé of an operation which I was called on to perform in a case of dilatation of ophthalmic vein, and which, to my gratification, proved successful.

My patient was a resident of Eagle Pass, Texas, a woman of 32 years of age, married, vigorous, and the mother of five children. The first of these died at the age of 5 months, of hydrocephalus, the second at 2 months, of "fever," and the third at 17 months, also of "fever." The fourth and fifth, both girls, aged respectively 4 years, and 5 months, are now living and in good health.

The patient, referring to the illness in which my services were solicited, stated that on Dec. 21, 1898, she was attacked by la grippe; from this date a humming began in her left ear; Jan. 1, 1889, she noticed that the sight of her left eye was becoming weak, and shortly succeeding that time the affection of the conjunctiva of that eye commenced.

I first saw her on January 18, and after obtaining from her the data given above, I proceeded to the thorough examination which the case demanded, finding a noticeable exopthalmic tumor of the eyelids and neighboring regions, accompanied by immovables and livids, with the conjunctiva strongly congested, and forming a burning wheel between the eye and the lower eyelid, which was so depressed as to prevent its elevation. The tension, the cornea and the iris were normal. (I did not make the ophthalmoscopic examination, because I had not the instruments with which to do so with me, nor, indeed, did I intend doing so afterward, because of the patient's delicate condition, and the lack of proper surroundings.) This, in addition to the very intense pain which she complained of, stating that it extended to the whole side of the head and face, and even to the nape of the neck, explained to me the insomnia, want of appetite, etc., from which she was suffering, and convinced me of the existence of a tumor on the back of the eye.

Suspecting that it might be a recto-ocular abscess, I proposed an examination under the influence of chloroform, to which, however, she would not accede. I then prescribed iodid of potassium, two grams daily, and bichlorid of mercury in lukewarm applications, myself administering an injection of morphin with atropin.

On the next day, the 19th, her condition was worse. I was then compelled to say that if they persisted in refusing to agree to the operation I had proposed, I would feel it incumbent on me to withdraw from the case. They agreed, therefore, to come to some conclusion in the matter within twenty-four hours. In the meanwhile I prescribed a continuation of the treatment then being tried, with the addition of two portions of chloral of two grams each, to be used in case the pain became intolerable. On the 20th, Dr. Duggan administering the chloroform, I introduced the bistoury in the external angle of the eye, coasting the surface of the socket as far as the cuspis (caruncle), which resulted in the flow of about sixty grams of blood. Next I made a careful examination with a blunt stiletto, but found no pus, and then made some shallow incisions in the conjunctiva, ordering the continuation of the former treatment.

When the patient recovered consciousness, she expressed great relief, which improvement was maintained for two days, when her condition became worse than it had been before. Suspecting, then, a venous dilatation, and, also, as the vision of that eye was lost, a hypopyon having appeared with the additional symptoms of sympathy in the other eye, I proposed enucleation, which was agreed to.

On January 30, Dr. Duggan again administered the chloroform, and I availed myself of the Volkmann spoon No. 1, to load and overset the ocular globe, because the nippers failed to grasp either conjunctiva or the tendon which was tearing it, and the spoon enabled an easier enucleation. I next proceeded to the examination of the cavity, and ascertained that there was dilatation of the ophthalmic vein of about one centimeter. I then abandoned the idea I had of binding the vessel that formed the aneurysm, as, having been prevented from giving the other treatment proposed by the authors, I was forced to leave matters as they were, which I particularly regretted, because, not only would the dilatation increase greatly through need of compression, but also the troubles consequent thereupon would follow, and probably result in the need of a further posterior operation. Fortunately, however, both for my patient and myself, I remembered the advice of Dr. G. Laurens, when the lateral breast comes open when ascending the mastoid prominence, and this seemed to be a similar case, notwithstanding the fact that he referred to the opening of the breast by accident, while in this instance it was through intent, besides which I had the advantage of being able to compress it by reason of a bony surface behind the vessel. The resolution was quickly followed by the operation. With a compress of bichlorid gauze in my left hand, and the spoon in my right, the dilatation was pulled out, producing a copious flow of blood. This, however, did not alarm me, as I expected and was prepared to control it, and did immediately, by compression with the gauze I held in my left hand. I immediately requested Dr. Duggan to assume charge of the compression, while I proceeded to thoroughly clean the operated part. I then raised the level of the compression above the borders of the orbit, placing over these a silver dollar to equalize the pressure at the center, and admit of free circulation in that locality. I then placed a thick wrapper of cotton and antiseptic bandage thereon.

After twelve days I removed these appliances, which had been retained all the while without producing any disagreeable odor, through my having kept them dampened with a solution of formol. There was a sudden hemorrhage, caused by the tearing of some fleshy blood clots. I applied a little glutol with fresh wrappers of gauze and cotton to the outside, which I held in place with a tight bandage. On February 17 I again removed this, without further flow of blood, applying a little glutol as before in the socket of the eye, with a gauze covering, but without a compressing bandage.

On February 20 I was again called in, the patient complaining of a slight pain, which she feared would increase. With the object of relieving this, and hastening the cicatrix retraction, I prescribed the insertion of fifteen to twenty drops of a weak solution of tannic acid and cocain. On the 28th I found everything progressing excellently, the patient informing me that she had discontinued the use of my last prescription after two days, because she had ceased to experience the trouble. Not a drop of pus was found after the removal of the bandages.

There remains at present, as the only trace of the severe illness, a slight humming noise in the ear, which she states has already greatly diminished, and during a good portion of the day disappears entirely, enabling her to sleep without difficulty.

As another incident, which may be of interest, I would mention the following: On Oct. 17, 1896, two partners and myself were called into consultation with Dr. Duggan, who was attending a brother of the patient referred to above. Having discovered that he was suffering from venous varices of the floor of the mouth, we suggested intervention, to which the family would not agree. He died the following day of asphyxia. He was 32 years of age.

Deductions.—It is undoubtedly true that the members of this family are predisposed to vascular dilatations. It is probable that the dilatation of the vein was somewhat lengthened in the interior of the skull, which produced the humming of the ear mentioned before. The cure was doubtless due to the suppression of the more extended part of the vein, and the formation of coagulated blood in the balance of the dilatation, and the presence of the gauze in the open extreme, and the lengthening of the coagulation to the walls of the vessel, which was proved by the complete cessation of the humming noise.

PROCEEDINGS OF THE FIFTH ANNUAL MEETING OF THE AMERICAN ACADEMY OF RAILWAY SURGEONS

FIRST DAY—MORNING SESSION.

EXECUTIVE SESSION.

The Academy convened in the Faculty Room of the John A. Creighton Medical College, in the city of Omaha, Neb., at 10 o'clock, a.m., Oct. 13, 1899, with Dr. W. W. Grant, president, in the chair.

Dr. J. P. Lord, Chairman of the Committee on Arrangements, made his report as to provision made for the comfort of the Fellows of the Academy. A request for copies of Transactions from the Medical Department of the University of California was read; on motion the same was ordered complied with.

Dr. D. S. Fairchild being the only member of the Executive Board present, the President appointed Drs. T. B. Lacey and L. E. Lemen as temporary members of said Board.

Applications for Fellowships were read from:

Dr. J. A. Quinn, Chief Surgeon G. N. R'y, St. Paul, Minn.

Dr. Chas. E. Booth, Division Surgeon C. & N.-W. R'y, Escanaba, Mich.

Dr. O. J. Veline, Surgeon G. N. R'y, Kerkhoven, Minn.

Dr. W. U. Cole, Chief Surgeon T. & O. C. and Hocking Valley R'ys, Columbus, Ohio.

Dr. A. L. Wright, District Surgeon C. & N.-W. R'y, Carroll, Iowa.

Dr. W. H. German, Surgeon C., R. I. & P. R'y, Morgan Park, Ill.

Dr. H. B. Jennings, Surgeon C., R. I. & P. and O. & St. L. R'ys, Council Bluffs, Iowa.

Dr. E. W. Lee, Surgeon B. & M. Ry, Omaha, Neb.

Dr. A. F. Jonas, Chief Surgeon U. P. R'y, Omaha, Neb.

Dr. F. A. Butler, Surgeon F. E. & M. V. R'y, Harvard, Neb.

Each application was accompanied by the fee of $5.00.

The applications were referred to the Executive Board.

The report of Dr. John E. Owens, as Chairman of Committee on Transportation was read, the same showing the provisions made for the Fellows in regard to transportation to this session. As copies of the report had been mailed to each member it is not embodied in the minutes.

The report of Dr. F. J. Hodges, Editor, was read, the same showing an expenditure of $10.00 for 1897, and $4.25 for 1898; said report was referred to the Executive Board.

The report of Dr. T. B. Lacey, Secretary, was presented, showing the expenditures of the office to have been $38.06; said report was also referred to the Executive Board.

A letter, with enclosures from Dr. C. B. Kibler, Treasurer, regretting his enforced absence, was received too late for the session. His report as Treasurer is as follows:

To the Fellows of the American Academy of Railway Surgeons:

The Treasurer begs to report that he has received from dues and application fees since last report	$245.00
Balance on hand at last report	279.71
Total	$524.71
Credit by cash, current expenses of the Academy, as per vouchers approved by the Executive Committee	512.30
Balance on hand	12.41

Most respectfully submitted,
C. B. Kibler, Treasurer.

The Secretary read several letters for next session.

SCIENTIFIC SESSION.

Dr. J. T. Eskridge read a paper on "Some Points in the Diagnosis of Traumatic Injuries of the Central Nervous System."

Discussed by Drs. Lacey, Lee, Lemen, Fairchild, Owens. Further discussion was, on motion, postponed till the afternoon session.

Dr. Evan O'Neil Kane presented a paper, with apparatus, on "A Simple Device for Rapid Hypodermoclysis in Combating Shock." No discussion.

On motion, the Academy adjourned till 2 o'clock p.m.

First Day—Afternoon Session.

The Academy re-assembled at 2 o'clock p.m. with the President in the chair.

EXECUTIVE SESSION.

The Executive Board made its report on applications and reports of officers referred to it at the morning session.

On a vote of the Academy the following were elected to Fellowship:

Dr. E. W. Lee.
Dr. H. B. Jennings.
Dr. A. L. Wright.
Dr. F. A. Butler.
Dr. W. H. German.
Dr. O. J. Veline.
Dr. A. F. Jonas.
Dr. J. A. Quinn.
Dr. W. U. Cole.
Dr. Chas. E. Booth.

The said report, recommended the approval of the financial accounts of the Secretary, $38.06, and Editor, $14.25; which on motion was adopted.

Dr. A. I. Bouffleur, President of the International Association of Railway Surgeons, being present, was invited to address the Academy, which he did in a felicitous manner, suggesting the advisability of unity in railway surgery matters, and enlarging on the good results that ought to follow.

It was moved, seconded and carried, that a special committee of three (3) be appointed to confer with Dr. Bouffleur and to report to an executive session to-morrow. The President appointed Drs. Eskridge, Owens and Fairchild as such committee.

SCIENTIFIC SESSION.

On motion the courtesies of the floor were extended to all visitors.

Dr. Eskridge now closed the discussion on his paper, presented during the morning session.

Dr. D. S. Fairchild presented a paper on "The Diagnostic Value of the Deep Reflexes of the Lower Extremities."

Discussion by Dr. Eskridge, and closed by Dr. Fairchild.

A paper by Dr. R. Harvey Reed, accompanied by photographs, on "Treatment of Minor Traumatisms," was read by the Secretary.

Discussed by Drs. Reineking, Lee, Bouffleur and W. U. Cole, and further discussion postponed till morning session.

Hon. T. J. Mahoney, of Omaha, presented a paper entitled "Suggestions on Rights and Liabilities of Surgeons."

An address by Hon. John L. Webster, of Omaha, was next in order. The same was highly interesting to the Academy, and gladly welcomed by the members.

L. L. Losey, Chief Claim Agent, Illinois Central Railway, presented a paper on "The Relation of Railway Surgeons and Claim Agents to Each Other."

Discussion followed by Hon. T. J. Mahoney, Drs. Lacey, Lemen, Eskridge, Bouffleur and Lee, and closed by Mr. Losey.

On motion a vote of thanks was tendered to Hons. T. J. Mahoney and John L. Webster for their efforts in the interests of the Academy.

On motion Mr. L. L. Losey was elected an Honorary Member of this Academy.

On motion the Academy adjourned till 9 o'clock tomorrow morning.

SECOND DAY—MORNING SESSION.

EXECUTIVE SESSION.

The Academy convened at 9 o'clock a.m. with the President in the chair.

Dr. Eskridge made the report for the special committee appointed to confer with Dr. Bouffleur, which report was as follows:

Mr. President and Fellow Members of the American Academy of Railway Surgeons:

Your committee, appointed to confer with Dr. Albert I. Bouffleur, President of the International Association of Railway Surgeons, with reference to the union of the Academy with the International Association, and requested to report to the Fellows of the Academy to-day, beg leave to submit the following:

1. In the opinion of your committee the American Academy of Railway Surgeons has a special reason for its existence, and its members should immediately take steps to make its existence desirable and perpetual, provided, however, that the work and aim of the Academy are on a high plane, and do not simply duplicate the ordinary routine work of larger associations.

2. The Academy, in continuing and perpetuating its existence and usefulness, should raise the standard of requirements for its members, guard every avenue to prevent applicants being admitted to membership without the necessary qualifi-

cations, to specialize, and thus improve the scientific work of its work by encouraging more technical papers in the lines of railway surgery, medicine and sanitation.

J. T. Eskridge.
John E. Owens.
D. S. Fairchild.

On motion, seconded and carried, the report was adopted.

The amendments to Constitution and By-Laws, offered at the last session, were taken up singly, for action.

1. (Amendment to Constitution): "To strike out the words *two hundred* in the fourth line of Par. 1 of Sec 3."

It was moved and seconded that said amendment be adopted. The vote being taken, said amendment was declared lost.

2. (Amendment to Constitution): "To strike out entire *first, second* and *third lines,* and *first two words* in fourth line of Par. 2, Sec. 3."

On motion, seconded and carried, the second amendment was *laid on the table.*

3. (Amendment to By-Laws): "To strike out the word *five* in the first line of Sec. 6, and insert, in lieu thereof, the word *three.*"

On motion, seconded and carried, the amendment to the By-Laws was *laid on the table.*

SCIENTIFIC SESSION.

Dr. W. U. Cole continued the discussion on the paper by Dr. Reed, as did also Dr. Lemen.

The President then presented his address, entitled, "Railway Hygiene and Emergency Equipment."

On motion the same was referred for publication, together with illustration of stretcher referred to in his address.

Dr. John E. Owens next read a paper on "Formaldehyde."

Discussion by Drs. Eskridge, Lee, Ruml, Bane, German, Crummer, Grant and Lemen, and closed by Dr. Owens.

Dr. C. D. Evans presented a paper, with illustrations, on "Treatment in Compound, Compound Comminuted, and Non-Union or Ununited, Fractures."

Discussion by Drs. Lacey, Lemen, Ruml, Lee, Boeckmann,
On motion the Academy adjourned till 1:30 p.m.
Quinn, and closed by Dr. Evans.

SECOND DAY—AFTERNOON SESSION.

EXECUTIVE SESSION.

The Academy re-assembled at 1:30 p.m., with the President in the chair.

On motion, the election of officers was declared the order of business, and the following were duly elected:

Dr. Chas. H. Wheaton, St. Paul, Minn,, President.

Dr. A. F. Jonas, Omaha, Neb., First Vice-President.

Dr. J. T. Eskridge, Denver, Colo., Second Vice-President.

Dr. T. B. Lacey, Council Bluffs, Iowa, Secretary and Editor.

Dr. D. S. Fairchild, Clinton, Iowa, Treasurer.

Dr. Wheaton invited the Academy to hold its next session at St. Paul, Minn.

On motion, the invitation was accepted.

On motion, the Secretary was instructed to furnish the President-elect a copy of the report of the special committee.

Dr. John E. Owens moved that a committee of four, of which the President shall be Chairman, be appointed to make suggestions furthering the interests of the Academy, to report at our next session. The same was seconded and carried and the President appointed Drs. Owens, Lacey and Eskridge as the balance of said committee.

On motion, the Secretary was instructed to return the thanks of the Academy to the various city convention leagues that had honored us with invitations to hold our next session in their respective cities.

On motion, the Secretary was authorized to employ a stenographer and typewriter whenever the duties of his office required it.

SCIENTIFIC SESSION.

Dr. Eduard Boeckmann read a paper on "Silver Catgut and How to Tie It," with samples.

Discussion by Drs. Lord and Lee; closed by Dr. Boeckmann.

Dr. Wm. C. Bane presented a paper, entitled, "Vision and Color Perception for Railway Service."

Discussion by Drs. Fulton, Eskridge, Lacey, Owens and Bouffleur; closed by Dr. Bane.

Dr. H. Reineking read a paper on "Craniectomy for Epileptiform Seizures and Grave Mental Disturbances Following

Head Injury, Without Apparent Fracture, with Report of a Case."

Discussion by Dr. Eskridge; closed by Dr. Reineking.

Dr. J. P. Lord presented a paper on "Treatment of Severe Crushing Injuries of the Extremities."

Discussion by Drs. Ruml and Boeckmann; closed by Dr. Lord.

On motion, Dr. J. A. Quinn was elected a member of the Executive Board.

On motion Drs. J. P. Lord and D. C. Bryant were elected Honorary Fellows.

Dr. Wheaton, President-elect, was conducted to the chair and welcomed to the station by the retiring President.

A paper entitled "Anesthesia," prepared by Dr. R. H. Cowan, of Radford, Va., was read by title.

On motion, the congratulations of the Academy were tendered to our retiring President, Dr. W. W. Grant, and to the Secretary, for their efforts in securing this very successful session.

On motion, the date of our next session was left to be determined by the President, Secretary and Executive Board.

In accordance with resolution, the President, Secretary and Executive Board have selected Wednesday and Thursday, Sept. 5 and 6. 1900, as the date of our next session.

The President appointed Drs. John E. Owens, W. W. Grant and C. K. Cole as Committee on Transportation. He also appointed Drs. Alex. J. Stone, J. A. Quinn and Haldor Sneve as a Committee on Arrangements.

The Academy having concluded the work of the session, a final adjournment was moved, and carried.

T. B. Lacey, Secretary.

OFFICIAL ROLL OF FELLOWS OF THE AMERICAN ACADEMY OF RAILWAY SURGEONS

1899-1900

Dr. David C. Ainey, Assistant Surgeon D., L. & W. R'y, New Milford, Pa.
Dr. F. K. Ainsworth, Surgeon So. Pac. R'y, Los Angeles, Cal.
Dr. E. Wyllys Andrews, Surgeon Wabash R'y, Chicago, Ill.
Dr. W. W. Appley, Surgeon N. Y., L. E. & W. R'y, Cochecton, N. Y.
Dr. H. A. Argue, Surgeon Erie R'y, Corning, N. Y.
Dr. S. C. Baldwin, Chief Surgeon S. L. & O. R'y, Salt Lake City, Utah.
Dr. J. F. Bancroft, Chief Surgeon, U. P., D. & G. R'y, Denver, Colo.
Dr. Wm. C. Bane, Oculist and Aurist, C., R. I. & P. R'y, Denver, Colo.
Dr. Amos W. Barber, Surgeon U. P., D. & G. R'y, Cheyenne, Wyo.
Dr. G. E. Benninghoff, Surgeon W. N. Y. & P. R'y, Bradford, Pa.
Dr. A. D. Bevan, Late Chief Surgeon Iowa Central R'y, Chicago, Ill.
Dr. W. T. Bishop, Medical Examiner Penn. R'y, Harrisburg, Pa.
Dr. W. R. Blakeslee, Surgeon N. Y., L. E. & W. R'y, Forest City, Pa.
Dr. Eduard Boeckmann, Consulting Surgeon G. N. and C. & G. W. R'ys, St. Paul, Minn.
Dr. Charles E. Booth, Division Surgeon C. & N. W., R'y, Escanaba, Mich.
Dr. A. P. Brumbaugh, Surgeon Penn. R'y, Huntingdon, Pa.
Dr. W. M. Bullard, Assistant Surgeon Mont. Cent. R'y, Helena,
Dr. James Burry, Chief Surgeon S. L., S. & E. R'y, Chicago, Ill.
Dr. F. A. Butler, Surgeon F. E. & M. V. R'y, Harvard, Neb.
Dr. F. H. Caldwell, Chief Surgeon S. F. & W. R'y, Waycross, Ga.
Dr. E. C. Carr, Surgeon P., C., C. & St. L. R'y, Coshocton, Ohio.
Dr. James Carter, Surgeon U. P. R'y, Carbon, Wyo.
Dr. M. Cavana, Surgeon N. Y., P. & O. R'y, Oneida, N. Y.
Dr. Geo. Chaffee, Surgeon L. I. R'y, Brooklyn, N. Y.
Dr. Henry Chapplo, Surgeon U. P. R'y, Billings, Mont.
Dr. Henry Coe, Surgeon East Side R'y, Portland, Ore.
Dr. C. K. Cole, Chief Surgeon Mont. Cent. R'y. Helena, Mont.
Dr. W. U. Cole, Chief Surgeon Hocking Valley and T. & O. C. R'ys, Columbus, Ohio.
Dr. G. P. Conn, Chief Surgeon C. & M. R'y, Concord, N. H.
Dr. D. H. Coover, Surgeon U. P. R'y, Denver, Colo.

Dr. Geo. W. Crile, Surgeon C., C., C. & St. L. R'y, Cleveland, Ohio.
Dr. R. H. Cowan, Assistant Chief Surgeon N. & W. R'y, Radford, Va.
Dr. W. T. Dalby, Assistant Surgeon U. P. R'y, Salt Lake City, Utah.
Dr. C. M. Daniels, Chief Surgeon Erie R'y, Buffalo, N. Y.
Dr. W. O. Daniels, Surgeon Georgia Penitentiary, Atlanta, Ga.
Dr. J. I. Darby, Chief Surgeon G. & A. R'y, Americus, Ga.
Dr. J. G. Davis, Chief Surgeon L., N. A. & C. R'y, Chicago, Ill.
Dr. LeRoy Dibble, Surgeon C., R. I. & P. R'y, Kansas City, Mo.
Dr. N. F. Donaldson, Assistant Surgeon U. P. R'y, North Platte, Neb.
Dr. Edward Dooley, Surgeon N. Y., L. E. & W. R'y, Buffalo, N. Y.
Dr. J. B. Eagleson, Div. Surgeon G. N. R'y, Seattle, Wash.
Dr. F. B. Eaton, Late Oculist Or. R'y & Nav. Co., San Jose, Calif.
Dr. J. T. Eskridge, Neurologist U. P. R'y, Denver, Colo.
Dr. W. L. Estes, Chief Surgeon L. V. R'y, So. Bethlehem, Pa.
Dr. C. D. Evans, Surgeon B. & M. R'y, Columbus, Neb.
Dr. A. E. Evans, Surgeon B. & O. R'y, Columbus, Ohio.
Dr. D. S. Fairchild, Div. Surgeon C. & N.-W. R'y, Clinton, Iowa.
Dr. W. J. Fairfield, Chief Surgeon C. & S. E. R'y, Anderson, Ind.
Dr. J. H. Ford, Chief Surgeon C., C., C. & St. L. R'y, Indianapolis, Ind.
Dr. L. C. Ford, Assistant Surgeon U. P. R'y, Lima, Mont.
Dr. S. M. Free, Surgeon B., R. & P. R'y, Du Bois, Pa.
Dr. Chas. B. Fry, Surgeon Big Four R'y, Mattoon, Ill.
Dr. John Fulton, Surgeon N. P. R'y, St. Paul, Minn.
Dr. W. J. Galbraith, Late Chief Surgeon U. P. R'y, Omaha, Neb.
Dr. M. Gardner, Chief Surgeon S. P. R'y, San Francisco, Calif.
Dr. Wm. H. German, Surgeon C., R. I. & P. R'y, Morgan Park, Ill.
Dr. David Gildner, Surgeon B. & O. R'y, Rockwood, Pa.
Dr. R. P. R. Gordon, Surgeon G. F. & C. R'y, Great Falls, Mont.
Dr. W. W. Grant, Surgeon C., R. I. & P. R'y, Denver, Colo.
Dr. J. D. Griffith, Consulting Surgeon K. C., F. S. & M. R'y, Kansas City, Mo.
Dr. Henry Hatch, Surgeon C., B. & Q. R'y, Quincy, Ill.
Dr. R. L. Harris, Surgeon Plant System, Orlando, Fla.
Dr. G. W. Harrison, Surgeon C. & N.-W. R'y, Ashland, Wis.
Dr. Jesse Hawes, Div. Surgeon U. P., D. & G. R'y, Greeley, Colo.
Dr. F. J. Hodges, Surgeon Wis. Cent. R'y, Ashland, Wis.
Dr. G. W. Hogeboom, Late Chief Surgeon A., T. & S. F. R'y., Topeka, Kansas.
Dr. H. B. Jennings, Surgeon C., R. I. & P. R'y, Council Bluffs, Iowa.
Dr. A. F. Jonas, Chief Surgeon U. P. R'y, Omaha, Neb.
Dr. Evan O'Neil Kane, Surgeon P. & E. and P. & W. R'ys, Kane, Pa.
Dr. Webb J. Kelly, Surgeon Big Four R'y, Galion, Ohio.
Dr. Samuel Kennedy, Surgeon Big Four R'y, Shelbyville, Ind.
Dr. T. C. Kennedy, Surgeon Big Four R'y, Shelbyville, Ind.
Dr. C. B. Kibler, Surgeon N. Y., P. & O. R'y, Corry, Pa.

Dr. J. P. Kirkpatrick, Surgeon Pan-Handle R'y, London, Ohio.
Dr. T. B. Lacey, Surgeon C. & N.-W. and Ill. Cent. R'ys, Council Bluffs, Iowa.
Dr. N. Y. Leet, Chief Surgeon D., L. & W. R'y, Scranton, Pa.
Dr. Sherman Leech, Surgeon B. & O. R'y, Columbus, Ohio.
Dr. L. E. Lemen, Div. Surgeon U. P. R'y, Denver, Colo.
Dr. E. W. Lee, Surgeon B. & M. R'y, Omaha, Neb.
Dr. C. B. Lyman, Assistant Division Surgeon U. P. R'y, Denver, Colo.
Dr. J. B. Caughey, Surgeon C. B. & A. R'y, Winona, Minn.
Dr. S. L. McCurdy, Surgeon Penn. Cent. R'y, Pittsburg, Pa.
Dr. Henry McHatton, Surgeon Southern R'y, Macon, Ga.
Dr. John McLain, Chief Surgeon P. P. C. Co., Pullman, Ill.
Dr. Wm. Mackie, Surgeon C., M. & St. P. R'y, Milwaukee, Wis.
Dr. K. A. J. Mackenzie, Chief Surgeon Ore. R'y & Nav. Co., Portland, Ore.
Dr. H. J. Maynard, Div. Surgeon U. P., D. & G. R'y, Cheyenne, Wyo.
Dr. W. J. Mayo, Surgeon C. & N.-W. R'y, Rochester, Minn.
Dr. Charles H. Merz, Surgeon L. E. & W. R'y, Sandusky, Ohio.
Dr. W. D. Middleton, Chief Surgeon C., R. I. & P. R'y, Davenport, Iowa.
Dr. M. V. S. Newcomer, Surgeon L. E. & W. R'y, Tipton, Ind.
Dr. R. Ortega, Chief Surgeon M. I. R'y, C. P. Diaz, Mexico.
Dr. John E. Owens, Chief Surgeon C. & N.-W. and Ill. Cent. R'ys, Chicago, Ill.
Dr. J. W. Perkins, Surgeon U. P. R'y, Kansas City, Mo.
Dr. C. B. Powell, Surgeon C., B. & Q. R'y, Albia, Iowa.
Dr. J. F. Pritchard, Dist. Surgeon C. & N.-W. R'y, Manitowoc, Wis.
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Dr. R. Harvey Reed, Surgeon U. P. R'y, Rock Springs, Wyo.
Dr. T. J. Redelings, Surgeon C. & N.-W. R'y, Marinette, Wis.
Dr. J. F. Reger, Surgeon B. & O. R'y, Littleton, W. Va.
Dr. H. Reineking, Surgeon C. & N.-W. R'y, Sheboygan, Wis.
Dr. A. Rhu, Surgeon Big Four R'y, Marion, Ohio.
Dr. Geo. Ross, Surgeon C. & O. R'y, Richmond, Va.
Dr. W. Ruml, Surgeon C. & N.-W. R'y, Cedar Rapids, Iowa.
Dr. Benton Saunders, Surgeon G. C. & S. F. R'y, Fort Worth, Tex.
Dr. F. J. Schug, Surgeon U. P. R'y, Tacoma, Wash.
Dr. C. M. Scott, Assistant Surgeon U. P. R'y, Fayette, Idaho.
Dr. A. C. Sherwood, Surgeon P. & E. R'y, Union City, Pa.
Dr. S. S. Shield, Surgeon N. Y., L. E. & W. R'y, Carbondale, Pa.
Dr. W. L. Smith, Surgeon C., R. I. & P. and A., T. & S. F. R'ys, Streator, Ill.
Dr. Haldor Sneve, Chief Surgeon C. & G. W. R'y, St. Paul, Minn.
Dr. Allen Staples, Div. Surgeon Ill. Cent. R'y, Dubuque, Iowa.
Dr. F. A. Stilling, Chief Surgeon C. & W. R'y, Concord, N. H.
Dr. A. J. Stone, Surgeon C., M. & St. P. R'y, St. Paul, Minn.
Dr. H. B. Tanner, Surgeon C. & N.-W. R'y, Kaukauna, Wis.
Dr. H. W. Thayer, Surgeon W. N. Y. & P. R'y, Corry, Pa.
Dr. A. G. Thompson, Assistant Oculist Penn. R'y, Philadelphia, Pa.